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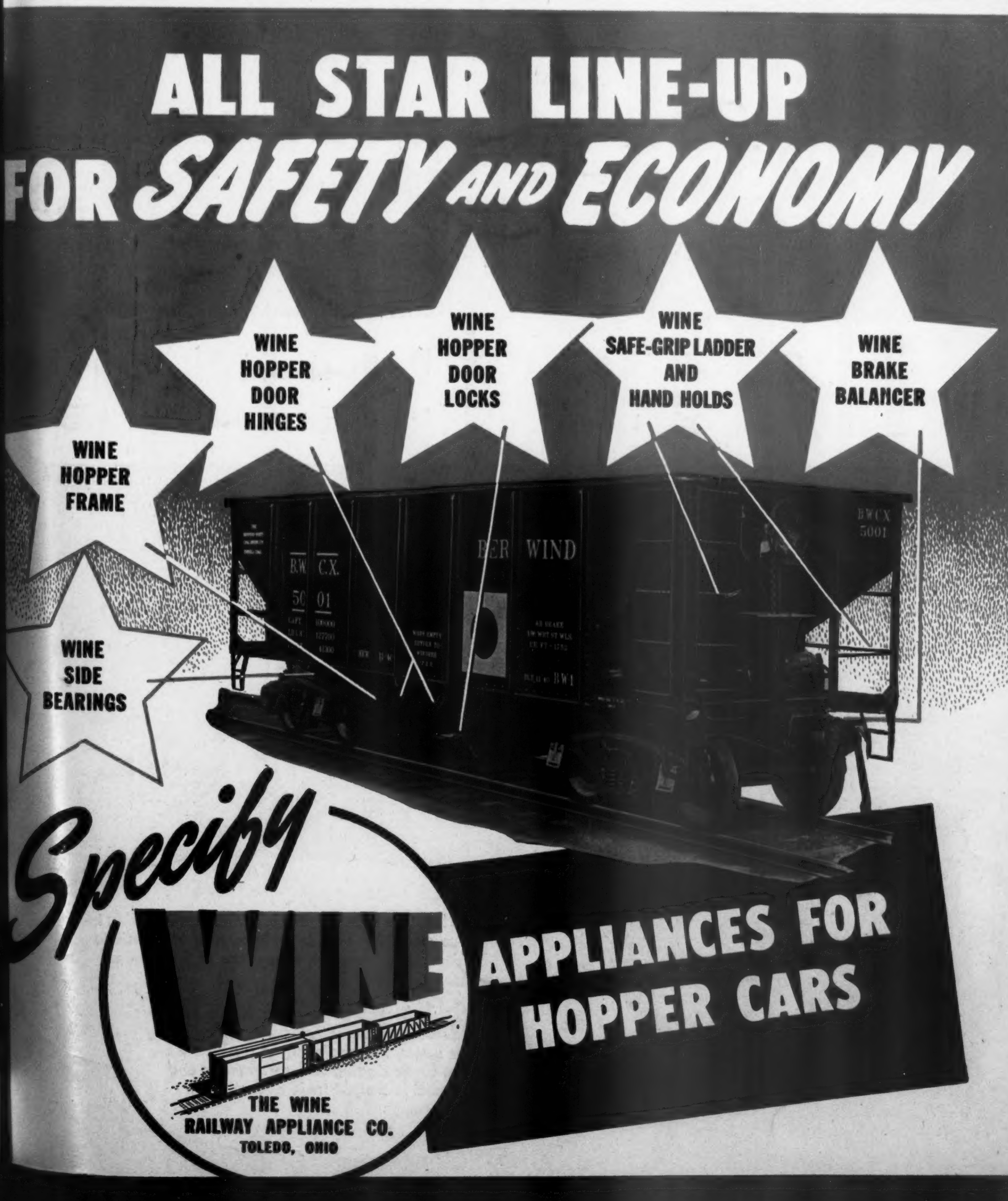

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Cars:

Locomotives:

General:

Editorials:

With the Car Foremen and Inspectors:

In the Back Shop and Enginehouse:

Electrical Section:

New Devices:

RAILWAY
MECHANICAL ENGINEER

Design Considerations for

Railway Passenger Cars*

By Col. E. J. W. Ragsdale †

Car structures contrasted with airplanes – "Redundant" structures are no longer impervious to analysis – The Budd full-car testing machine is described

THE stresses of an airplane are more readily and far more accurately calculated than can be those of a railroad car. In the first place, the forces of flight and even those of landing are definitely established. We know what they are. Those of a crash have to be disregarded for we cannot hope to design against such. Significantly enough, a "crash" becomes a "crack-up" in airplane parlance.

In railroad practice, however, it is the crash which commands attention. Operating forces are insignificant. Only when a car leaves the rails or gets into a collision does the car structure become heavily involved. Railroad speeds are so much less than those of the airplane that the passengers rarely suffer serious injuries so long as the structure remains intact. Of course, accidents know no formula and no two of them are alike but, over the years, they have assumed a certain pattern and we do know in general what to guard against.

So, while the airplane is designed by formula, the railroad car is the outgrowth of experience.

Another difference is found in the fact that airplane manufacturers are structurally conscious and will permit dispositions of strength members such as would not be tolerated in a railroad car. For instance, a once popular passenger plane had the bottom wing chord passing straight through the fuselage so that it offered a sixteen inch hurdle across the aisle. If, on the other hand, the bolster beam of a railroad car raised the floor one-half inch at that point it would have to be redesigned. Railroad passenger cars are designed around the accommodation and the equipment, yet structurally they have to be sufficient.

Of course, it is hard to say just what is sufficient. People have different ideas about that, but the Association of American Railroads has set up what it considers at least a minimum practice.

A Look at Design Theory

It stipulates, for instance, that a passenger car should withstand a push in line of couplers up to 800,000 lb., and show 500,000 lb. in line of buffers; and it gives a 134,000 lb. loading across the end collision posts at 18 in. above the floor and a whole lot of other stuff. I shall not burden you with the details. If you are in the business, you will know them, and if you are not you will already have some idea of the magnitude of the forces involved. Mind you, they are minimum values. We at the Budd Company don't believe in building down to them and have upped them by several hundred per cent. By using a high-tensile stainless steel we can afford to do this. Our center sill, for instance, will take over 2,000,000 lb. in compression and that is the backbone of the car.

However, the car structure cannot be considered component-wise. It functions as a whole and has to be calculated as such. We have to know how the various structural members share the load, or if they do. That isn't so simple. It is almost as difficult as apportioning a rich bachelor's estate among all of the deserving relatives.

For this we use what someone with a perverted sense of humor called the "Theory of Least Work." Thank goodness it wasn't in use when I went to college. In my time we pin-jointed structures. If we didn't, we couldn't figure them. We made cat's cradle sort of diagrams called "graphical statics" and from these we measured the forces with a tape measure. It was all very simple and somehow we got through school. Of course, we were warned that if we heavily gusseted some joint, the thing might become "redundant" and that word assumed more fearsome meaning than would the term "untouchable" to a Hindu.

In the meantime, the doctors have gotten busy. They first found out that a redundant structure can be more efficient than one which is merely pin-jointed. Worse yet, they found out how to figure this redundancy business. That is where this Least Work Theory comes in.

If you don't already know it, I do not recommend that you try to learn it. Like so many nice theories, it starts off with a disarming simplicity. It says, to begin with, that if a bridge structure deflects one inch under a 10,000 lb. load in the center, the amount of work done is 10,000 in. lb. Well! I can understand that and don't refute it, but then it goes on to say that this is the total amount of work done and therefore all of the little works which go into stretching or compressing all of the members of the bridge must eventually add up to 10,000. Next I am embarrassed by the thought that bridges don't have just 10,000 lb. loaded in the center. That load is apt to be anywhere and usually not all in one lump. So I call in the doctors. Since the Theory of Least Work is involved it takes two doctors, one Ph.D., fourteen pencils and three months. Worse yet, test will prove that they are right.

The simultaneous equations set up for determination of the side frame of a railroad coach number 47. I hesitate to venture a guess as to the equations involved in the en-

*A paper presented before the Southern Ohio section of the Society of Automotive Engineers, February 13, 1946.

† Colonel Ragsdale was chief engineer railway division, Edw. G. Budd Manufacturing Co., Philadelphia, Pa., at the time of his death on February 24.

tire car structure. My feelings and admiration can only be expressed by saying how gratified I am that there are people who love this sort of work, and who are proficient in it.

Anyway, I do have my revenge and, incidentally, so do the doctors.

Testing the Car Structure

After a hundred years or more of car building, the Budd Company put up the first and the only plant in which a complete car can be tested. It can be loaded vertically. The sides can be pushed in and it can be pushed endwise to the tune of 2,000,000 lb. Some 500 SR-4 electric strain gauges and 68 Huggenberger extensometers show the stresses in every member, important or otherwise. The electric strain gauges have enormously speeded up the process of testing. All gauges are wired into a center panel and the readings are recorded as fast as the operator can push buttons. In three days we have accomplished as much work as we used to do in three months.

The testing machine is housed in a separate building. It consists of a 2,000,000-lb. Baldwin-Southwark compression machine mounted horizontally some fourteen feet above the floor. The test car—usually a skeleton structure—is rolled in over tracks on the ground floor and onto a lift table. This is then raised to any desired point of load application. Two 10½-in. round tension rods pass to either side of the car and connect to a reaction head some 90 ft. away; leastwise, a 90-ft. car can be tested. The tension rods are jointed so that even a 2-ft. specimen can be compressed.

Both compression and reaction heads may be moved sidewise so that diagonal loading becomes possible. All loadings, however, have to be on a horizontal plane.

Vertical loading of the car is accomplished by having a series of hydraulic jacks mounted on the floor of the car and connected by straps to the tracks beneath. These are all manifolded to a common pressure system. Then side loadings are made by securing these same jacks to certain columns of the building. In neither case are the loads anywhere near as great as are those of end compression. The live load of a passenger car rarely exceeds 10,000 lbs.

A modern, lightweight coach weighs some 112,000 lb. This weight divides almost equally into one-third body, one-third trucks and one-third equipment and appointments. There is no use trying to compare this with the older conventional coaches of 150,000 lb., because the newer equipment carries so much more equipment. Indicative of this is the fact that the older coach had a 7½ kw. axle generator, while railroad engines are now talking 32 kw.

The choice of material naturally influences design. Aluminum with its greater bulk, and hence greater plate stability, naturally favors a skin-stressed structure. The low alloys of steel are mostly used in a skin-stressed structure, too, but one in which the sheathing is frequently stabilized by attached stiffereners. Stainless steel, with its much greater tensile strength, is best utilized in a truss system of side framing.

My own company has favored the use of stainless steel ever since the beginning of the lightweight movement. It has many advantages aside from the obvious one of corrosion resistance. Its use, however, did involve a new philosophy of design. Of course, the effective use of any very high-tensile steel would do this. The problem is one of thinness and how to make it effective in compression or in panels. Very few members are ever in pure tension. A bicycle spoke is the only one I can think of at the moment, but we don't use any of these in car construction.

The Character of the Stainless Structure

Accordingly, the Budd cars differ radically from all others in structural design. To begin with, the roof becomes a principal structural member, not only when considering the car as a beam but also in end compressive loadings. It is not merely an umbrella to keep the weather out. It takes over one-third of the total bending moment of the car, and yet the metal used is about the thickness—or shall I say the thinness—of a calling card. It is a real compression member and so it should be. The roof has the greatest expanse of any member in the car. It is furthest removed from the neutral axis. Some of you engineers may recall your My/I. And, furthermore, the roof has to be walked on. So we simply take a lesson from the paper box manufacturers and corrugate this thin sheathing fore and aft. In addition, two heavy stringers run the full length of the roof from end collision post to end collision post. They not only contribute towards giving an end compressive strength four or five times that required by the Railroad Association, but they act as efficient guard rails in case of an accident which might otherwise invade the roof.

So the roof becomes the upper chord of the beam. It is tied into the lower chord, which is the floor system, by the side frames. These would be quite simple members if it were not for a railroad prejudice against triangular windows. Otherwise we could use a Pratt Truss as they do for freight cars. Instead we have to use a modification which is technically known as a Vierendeel Truss. The diagonal ties into the vertical post about half way up and I don't have to tell you what you can look out for in the corner of the window opening. It doesn't matter whether you use a skin stressed construction or a truss—there can be trouble there. We mitigate the condition by running a strong lower window rail from one end of the car to the other. This, too, serves a dual purpose in guarding against structural invasion by sideswiping.

Of course, this type of framing throws a queer combination of compression, shear and bending into the side post just above the lower line of the windows. The good old Theory of Least Work does a job here, but we supplement it by use of plastic models and thereby determine the point of contraflexure in the vertical post somewhere between the window ledge and the roof. The doctors love that point of contraflexure. It becomes somewhat of a datum line or neutral axis or starting point from which even more complicated formulas can be evolved.

Finally, we come to the floor system or underframe. There is plenty of heft in that. It has to stand abuse as well as use. We have to be able to stamp on it. All sorts of equipment has to be hung from it. Adjacent cars ram hell out of it, and almost anything can happen to it, but it mustn't ever fail. It has more obligations than the double bottom of a ship.

Part of the underframe is the side sill, one on either side, but this is more properly speaking part of the side frame. The two side sills are tied together by the floor beams. In our latest construction these consist of 4½ inch deep channels running laterally and all welded together to form a continuous underflooring—just like so much planking on a bridge—only the channels face upward and are closed by a plywood flooring.

In the middle of the car the floor channels are welded to a center sill. This is really the backbone of the car, and eventually it ties into the draft gear and couplers. The A. A. R. lays great stress upon the value of this member. It stipulates a minimum compressive value of 800,000 lb. We at the Budd Company go considerably above this. In fact, we exceed 2,000,000 lb. With stainless steel we can do this with no increase of weight.

(*Continued on page 121*)

Locomotive Defects Checked

Report of John M. Hall, director, Bureau of Locomotive Inspection, for 1945 fiscal year shows first recession in the number of defects in violation of the rules since 1940—Destructiveness of boiler explosions still a matter of concern

For the first time since 1940 an annual report of the Bureau of Locomotive Inspection to the Interstate Commerce Commission shows a decline in the number of defects found in violation of the locomotive inspection rules. In his report for the fiscal year ended June 30, 1945, John M. Hall, director of the bureau, shows 53,367 such defects on the 11,975 locomotives found defective. These compare with 56,617 on the 12,710 defective locomotives in the preceding fiscal year, which was the peak of an unbroken annual increase from the 32,677 defects found 8,565 defective locomotives in the fiscal year 1940.

The same encouraging check in the persistent downward trend of locomotive conditions is recorded with respect to accidents and casualties resulting from the failure of steam locomotives and their appurtenances. Beginning in 1941 with 153 accidents and 197 casualties, there were 403 accidents and 491 casualties in 1944. Although the number of accidents increased slightly to 410 in 1945, the number of casualties decreased to 449. These were divided between 20 deaths and 439 injuries, representing a decrease of five in the number of persons killed and of 37 in the number of persons injured as compared with 1944.

In addition to the tables reproduced in this abstract, the report includes a classification of the number of casualties according to occupation for steam locomotives and locomotives other than steam, a chronological list of all accidents and casualties reported arranged by individual railroads, and a tabulation by individual parts of the defects found on locomotives inspected on each railroad.

The report in abstract follows.

Eight Boiler Explosions

Eight boiler explosions occurred in the fiscal year; all were caused by overheating of the crown sheets due to low water. Nine employees were killed in these accidents, and 12 employees were injured. There was a reduction of 11 in the number of boiler explosions, a reduction of 3 in the number of persons killed, and a reduction of 50 in the number of persons injured as compared with the next preceding year.

One of these accidents, in which two employees were injured, occurred while the locomotive was hauling a passenger train at an estimated speed of 30 miles an hour. The boiler was broken from the frame and cylinder saddle attachments and forced out of alinement but remained on the frame. The arch tubes, grates, ashpan, and brick arch were blown from the locomotive and scattered in various directions within a radius of 300 ft. from the point of explosion. The trailing truck wheels, the tender, the first

Table I—The Number of Locomotives in Service, the Number Inspected, and the Conditions Found

STEAM LOCOMOTIVES

	Year ended June 30—					
	1945	1944	1943	1942	1941	1940
Number of locomotives for which reports were filed	43,019	43,297	43,064	42,951	43,236	44,274
Number inspected	115,979	117,334	116,647	113,451	105,675	102,164
Number found defective	11,975	12,710	11,901	10,970	9,570	8,565
Percentage inspected found defective	10	11	10	10	9	8
Number ordered out of service	506	630	487	474	560	487
Number of defects found	53,367	56,617	51,350	44,928	37,691	32,677

LOCOMOTIVES OTHER THAN STEAM

	Year ended June 30—					
	1945	1944	1943	1942	1941	1940
Number of locomotives for which reports were filed	6,094	5,139	4,351	3,957	3,389	2,987
Number inspected	9,888	7,711	6,847	6,728	5,558	4,974
Number found defective	447	378	298	358	319	298
Percentage inspected found defective	4.5	4.9	4.4	5	6	6
Number ordered out of service	16	9	6	12	21	16
Number of defects found	1,212	1,026	849	928	905	766

Table II—Accidents and Casualties Caused by Locomotive Parts and Appurtenances

STEAM LOCOMOTIVE, INCLUDING BOILER, OR TENDER

	Year ended June 30—					
	1945	1944	1943	1942	1941	1940
Number of accidents	410	403	319	222	153	164
Per cent increase or decrease from previous year	1.7[1]	26.3[1]	43.7[1]	45.1[1]	6.7	7.9[1]
Number of persons killed	20	25	27	34	15	18
Per cent increase or decrease from previous year	20.0	7.4	20.6	126.7[1]	16.7	20.0[1]
Number of persons injured	429	466	373	227	182	225
Per cent increase or decrease from previous year	7.9	24.9[1]	64.3[1]	24.7[1]	19.1	37.2[1]

STEAM LOCOMOTIVE BOILER[2]

	Year ended June 30—							
	1945	1944	1943	1942	1941	1940	1915	1912
Number of accidents	141	141	129	81	43	67	424	856
Number of persons killed	13	17	25	30	12	16	13	91
Number of persons injured	154	194	173	83	64	110	467	1,005

LOCOMOTIVES OTHER THAN STEAM

	Year ended June 30—					
	1945	1944	1943	1942	1941	1940
Number of accidents	29	17	15	9	11	7
Number of persons killed	1	..	..	..	..	..
Number of persons injured	40	23	18	9	11	7

[1] Increase.
[2] The original act applied only to the locomotive boiler.

Table III—Accidents and Casualties Resulting from Locomotive Failures

Steam Locomotives and Tenders and Their Appurtenances

Year ended June 30—

Part or appurtenance which caused accident	1945			1944			1943			1942			1941		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Air reservoirs	1	..	1	3	..	4	..	..	..	1	..	1	..	..	..
Aprons	8	..	8	7	..	7	1	..	1	..	..	..	..	..	..
Arch tubes	..	..	..	1	..	2	..	..	..	..	..	..	..	..	..
Ashpan blowers	2	1	1	..	..	..	1	..	1	1	..	1	..	..	..
Axles	2	..	5	5	1	5	1	..	1	1	..	1	1	..	4
Blow-off cocks	7	..	7	8	..	8	8	..	8	8	..	8	..	..	..
Boiler checks	6	..	6	9	..	9	8	1	7	3	..	3	4	1	5
Boiler explosions:															
A. Shell explosions	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
B. Crown sheet; low water; no contributory causes found	7	9	11	12	7	19	19	22	48	8	18	11	7	6	27
C. Crown sheet; low water; contributory causes or defects found	1	..	1	7	5	43	4	..	6	5	5	7	4	5	2
D. Miscellaneous firebox failures	1	..	1	..	..		2	2	2	2	..	2	..	..	..
Brakes and brake rigging	10	..	10	12	..	12	11	..	13	4	1	3	5	..	6
Couplers	5	..	6	6	..	9	3	..	3	3	..	3	1	..	1
Crank pins, collars, et cetera	5	1	4	7	..	9	6	1	9	1	..	1	2	..	2
Crossheads and guides	2	..	2	8	..	8	2	..	2	..	..	..	..	..	..
Cylinder cocks and rigging	1	..	1	3	..	3	4	..	4	1	..	1	..	..	..
Cylinder heads and steam chests	2	..	3	1	..	1	5	..	5	1	..	1	..	..	..
Dome caps	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Draft appliances	2	..	3	2	..	3	1	..	1	1	..	2	1	..	1
Draw gear	2	..	2	1	..	1	1	..	1	..	..	..	1	..	1
Fire doors, levers, et cetera	8	..	8	6	..	6	5	..	5	6	..	6	7	..	7
Flues	5	..	6	8	..	9	5	..	10	3	1	2	5	..	6
Flue pockets	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Footboards	13	1	12	6	..	6	4	..	4	5	..	5	2	..	2
Gage cocks	1	..	1	..	..	..	..	..	..	1	..	1	..	..	..
Grease cups	1	..	1	1	..	1	2	..	3	3	..	3	1	..	1
Grate shakers	17	..	17	19	..	19	18	..	18	12	..	12	4	..	4
Handholds	26	1	25	14	..	14	18	..	18	10	..	10	11	..	11
Headlights and brackets	7	..	7	..	..	..	4	..	4	1	..	1	..	..	..
Injectors and connections (not including injector steam pipes)	12	..	12	8	..	8	7	..	7	4	..	4	3	..	3
Injector steam pipes	1	..	1	..	..	..	2	..	2	2	..	2	..	..	..
Lubricators and connections	4	..	4	5	..	5	7	..	7	5	..	5	3	..	3
Lubricator glasses	1	..	1	1	..	1	..	..	..	1	..	1	..	..	..
Patch bolts	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pistons and piston rods	2	1	1	3	..	3	1	..	1	1	..	1	1	..	2
Plugs, arch tube and washout	5	2	6	6	3	7	2	..	3	3	1	5	1	..	2
Plugs in firebox sheets	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..
Reversing gear	13	..	13	16	..	16	14	..	14	19	..	19	11	..	12
Rivets	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Rods, main and side	7	..	11	7	2	9	7	..	10	4	..	5	3	2	2
Safety valves	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sanders	8	..	8	12	..	12	2	..	2	2	..	2	2	..	2
Side bearings	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Springs and spring rigging	5	1	4	6	2	8	7	..	8	2	..	2	6	..	6
Squirt hose	23	..	25	21	..	22	16	..	16	7	1	6	3	..	3
Staybolts	4	..	4	4	1	4	4	..	4	2	2	..	1	..	1
Steam piping and blowers	12	..	14	11	..	14	9	..	15	6	1	5	2	..	2
Steam valves	7	..	7	7	..	7	9	..	10	5	1	4	4	..	4
Studs	1	..	1	..	..	..	1	..	1	1	..	1	..	..	..
Superheater tubes	4	..	6	2	..	2	4	..	5	2	..	2	2	..	2
Throttle glands	2	..	2	2	..	2	..	..	..	1	..	1	..	..	..
Throttle leaking	2	..	3	1	..	1	1	..	1	..	..	..	..	..	..
Throttle rigging	6	..	6	9	..	9	4	..	4	4	..	4	4	..	5
Trucks, leading, trailing, or tender	5	..	5	5	1	5	3	..	4	11	3	11	3	..	5
Valve gear, eccentrics, and rods	7	..	7	10	1	9	3	..	3	3	..	4	4	..	4
Water glasses	10	..	10	14	1	13	11	..	11	7	..	7	..	..	..
Water-glass fittings	1	..	1	2	..	3	..	..	..	..	..	..	..	..	..
Wheels	1	..	1	1	..	1	2	..	2	1	..	1	2	1	1
Miscellaneous	124	3	126	103	1	106	70	1	69	48	..	50	42	..	43
Total	410	20	429	403	25	466	319	27	373	222	34	227	153	15	182

Locomotives Other Than Steam, and Their Appurtenances

Year ended June 30—

Part or appurtenance which caused accident	1945			1944			1943			1942			1941		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Brakes and brake rigging	3	..	8	1	..	3	1	..	1	..	..	..	1	..	1
Carburetors	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Couplers	1	..	4	3	..	3	1	..	1	1	..	1	..	..	..
Crank pins and connecting rods	2	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Fires: Due to overflowing or leakage of fuel, crank case explosions, back firing, et cetera	6	..	6	4	..	5	3	..	5	3	..	3	4	..	4
Generators and staring devices	..	..	..	..	..	..	1	..	1	..	..	..	1	..	1
Insulation	1	..	1	..	..	..	..	..	..	1	..	1	..	..	..
Pantographs and trolleys	2	1	1	..	..	..	1	..	1	1	..	1	..	..	..
Short circuits	2	..	2	1	..	1	3	..	4	..	..	..	..	..	..
Miscellaneous	12	..	16	8	..	11	5	..	5	3	..	3	5	..	5
Total	29	1	40	17	..	23	15	..	18	9	..	9	11	..	11

two cars, and the front truck of the third car were derailed, and the locomotive and train stopped in a distance of approximately 265 ft.

In another accident, in which the locomotive was hauling a passenger train, the explosion occurred while standing at a signal governing movement over an approach crossover leading into a passenger station. One arch tube, grates, and brick arch were blown out of the firebox. Pieces of brick arch started fires in a woodworking shop 300 feet distant, part of the stoker exhaust pipe was found near some boarding cars 250 ft. away, and a piece of grate side frame was found imbedded in an engine house door 300 ft. from the point of explosion. One employee was killed and one employee was injured in this accident.

Two employees were killed in an explosion which occurred while the locomotive was hauling a troop train at an estimated speed of 30 miles an hour. The force of the explosion tore the boiler from the running gear and hurled it upward and forward. The boiler struck the ground, rebounded twice, and came to rest 265 ft. ahead of the point of explosion and 33 ft. to the right of the track. Parts of the wreckage were scattered over an area within a radius of 415 ft.

Three employees were killed and one employee was injured in an explosion which occurred while the locomotive was hauling a freight train at an estimated speed of 40 to 45 miles an hour. The locomotive, tender, and 22 cars were derailed, 15 cars and the locomotive and tender frame were massed within a space of 160 ft., and the lading in 13 cars was badly damaged or destroyed by fire.

Three employees were killed in an explosion which occurred while the locomotive was hauling a freight train at an estimated speed of 12 to 15 miles an hour. The boiler was torn from the running gear and hurled 190 ft. forward, where it struck and damaged the track, rebounded, and came to rest at the foot of a fill, 374 ft. from the point of explosion. The running gear, tender, and the first six cars of the train were derailed at the damaged section of the track, and the running gear and tender overturned. Parts of the wreckage were scattered over an area within a radius of 675 ft.

Eight employees were injured in the remaining three accidents.

Low-Water Alarms Sounded

The boilers of the locomotives in-

volved in the first, second, and fourth explosions cited above were equipped with low-water alarms. In the first and second instances the low-water alarms were sounding and giving clearly audible warnings that the water was at or below the danger point, and there was sufficient time from the first soundings of these alarms until the explosions occurred either to restore a safe water level or to dump the fire and thus avoid the explosions. It is not known whether the low-water alarm on the boiler in the fourth instance functioned before the explosion occurred as all employees on the locomotive were killed in the accident and others on the train were not sufficiently close to the locomotive to hear the alarm if it had sounded. Parts of this alarm were damaged in the accident to such extent as to preclude the making of a service test prior to repairs and adjustment, but such tests as could be made indicated that the alarm had been in operative condition, and it is known to have functioned as intended on the last trip of the locomotive before the accident occurred.

In the third cited instance, low steam pressure occurred, apparently principally due to tramp iron in the coal interfering with proper operation of the front feed stoker. A stop had been made to remove the foreign matter from the stoker, but further trouble was experienced with low steam pressure, work on the fire was done at two stops, and a whistle signal calling for a relief locomotive at the next terminal was sounded at a tower; the explosion occurred about 1½ miles beyond this point. There was a placard in the cab of the locomotive showing five illustrations of the wreckage caused by a boiler explosion and with printed instructions over the name of the vice-president of the railroad, "Do not trade water for steam—if you are losing water with feedwater pump and injectors working, stop and investigate. If unable to correct — remove fire, avoiding damage to crown sheet."

The results for the year represent a 58 per cent reduction in the number of explosions, a 25 per cent reduction in the number of persons killed, and an 81 per cent reduction in the number of persons injured compared with 1944; a reduction of 68 per cent in the number of explosions, of 63 per cent in number of persons killed, and 79 per cent in the number of persons injured compared with 1943; a reduction of 38 per cent in the number of explosions, 61 per

Table IV—Number of Locomotives Reported, Inspected, Found Defective, and Ordered from Service

STEAM LOCOMOTIVES

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30— 1945	1944	1943	1942	1941	1940
Air compressors	1,054	1,146	968	829	684	567
Arch tubes	17	45	50	27	31	20
Ashpans and mechanism	81	93	71	80	67	37
Axles	11	15	15	2	5	3
Blow-off cocks	361	289	291	238	205	191
Boiler checks	511	533	503	393	313	288
Boiler shell	416	406	377	290	271	266
Brake equipment	2,755	2,914	2,661	2,382	1,945	1,506
Cabs, cab windows, and curtains	1,057	1,169	1,102	1,163	1,087	1,078
Cab aprons and decks	426	381	390	335	307	277
Cab cards	91	104	142	131	97	101
Coupling and uncoupling devices	57	65	66	70	74	53
Crossheads, guides, pistons and piston rods	2,079	2,149	1,961	1,273	858	815
Crown bolts	90	105	66	75	97	54
Cylinders, saddles, and steam chests	1,801	2,133	1,395	1,514	1,332	1,320
Cylinder cocks and rigging	454	624	430	521	438	447
Domes and dome caps	187	189	196	112	94	78
Draft gear	486	576	599	651	620	508
Draw gear	447	515	469	369	347	306
Driving boxes, shoes, wedges, pedestals, and braces	1,803	2,026	2,053	1,743	1,348	1,243
Fireboxe sheets	319	347	303	255	224	191
Flues	260	274	215	178	150	147
Frames, tail pieces, and braces, locomotive	852	1,019	894	869	863	665
Frames, tender	97	126	86	86	83	78
Gages and gage fittings, air	151	158	191	193	183	132
Gages and gage fittings, steam	353	328	316	263	236	211
Gage cocks	449	532	584	497	373	400
Grate shakers and fire doors	558	539	492	491	430	273
Handholds	527	464	483	378	433	333
Injectors, inoperative	41	46	66	47	39	30
Injectors and connections	2,553	2,867	2,637	2,220	1,882	1,330
Inspections and tests not made as required	9,067	9,565	9,037	8,186	7,215	6,218
Lateral motion	977	898	700	498	357	313
Lights, cab and classification	167	243	184	131	50	49
Lights, headlight	222	268	184	218	190	180
Lubricators and shields	306	257	292	234	196	185
Mud rings	257	301	256	244	187	213
Packing nuts	654	746	669	689	508	418
Packing, piston rod and valve steam	845	879	724	738	675	660
Pilots and pilot beams	171	193	194	188	142	140
Plugs and studs	245	281	259	173	156	156
Reversing gear	439	454	452	411	387	320
Rods, main and side, crank pins, and collars	2,569	3,230	2,798	1,986	1,565	1,199
Safety valves	84	77	74	67	68	61
Sanders	658	609	642	738	490	415
Springs and spring rigging	4,734	4,625	3,583	3,349	2,597	2,174
Squirt hose	98	94	92	67	62	50
Stay bolts	351	400	367	272	239	227
Stay bolts broken	308	232	247	274	198	271
Steam pipes	416	435	414	290	385	255
Steam valves	157	161	159	150	110	106
Steps	681	872	729	594	555	449
Tanks and tank valves	1,215	1,400	1,321	1,150	952	768
Telltale holes	78	69	78	79	59	95
Throttle and throttle rigging	948	948	887	786	688	647
Trucks, engine and trailing	1,151	1,155	1,020	833	636	598
Trucks, tender	974	928	900	786	773	705
Valve motion	991	1,021	998	779	580	506
Wash-out plugs	820	845	685	569	445	478
Train-control equipment	2	5	9	7	1	2
Water glasses, fittings, and shields	1,328	1,323	1,454	1,133	788	753
Wheels	899	759	728	664	536	554
Miscellaneous—Signal appliances, badge plates, brakes (hand)	1,211	1,167	1,142	970	785	564
Total number of defects	53,367	56,617	51,350	44,928	37,691	32,677
Locomotives reported	43,019	43,297	43,064	42,951	43,236	44,274
Locomotives inspected	115,979	117,334	116,647	113,451	105,675	102,164
Locomotives defective	11,975	12,710	11,901	10,970	9,570	8,565
Percentage of inspected found defective	10	11	10	10	9	8
Locomotives ordered out of service	506	630	487	474	560	487

LOCOMOTIVES OTHER THAN STEAM

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30— 1945	1944	1943	1942	1941	1940
Air compressors	14	7	7	13	22	8
Axles, truck and driving	...	...	6	...	5	...
Batteries	...	1	2	1	6	1
Boilers	8	...	1	5	4	10
Brake equipment	114	85	62	86	69	50
Cabs and cab windows	59	40	33	27	45	22
Cab cards	25	21	17	20	24	13
Cab floors, aprons, and deck plates	60	54	31	10	14	17
Clutches	2	1	2	1	...	...
Controllers, relays, circuit breakers, magnet valves, and switch groups	18	14	9	12	7	16
Coupling and uncoupling devices	6	3	1	5	2	6
Current collecting apparatus	10	...	1	1	3	1
Draft gear	14	14	15	19	15	31
Draw gear	8	...	2	3	3	2
Drivnig boxes, shoes, and wedges	29	12	25	16	36	29
Frames or frame braces	12	12	7	5	1	12
Fuel system	45	33	32	81	62	51
Gages or fittings, air	7	6	3	8	3	1
Gages or fittings, steam	...	2	1	...	...	2
Gears and pinions	...	1	4	4	2	1
Handholds	13	6	19	14	12	6
Inspections and tests not made as required	297	278	223	274	243	207
Insulation and safety devices	17	8	4	3	4	2

Locomotives Other Than Steam (Continued)

Parts defective, inoperative or missing, or in violation of rules	Year ended June 30— 1945	1944	1943	1942	1941	1940
Internal-combustion engine defects, parts and appurtenances	133	86	50	62	54	35
Jack shafts	6	8	2	1	3	7
Jumpers and cable connectors	9	2	3	1	...	...
Lateral motion, wheels	20	9	10	...	4	5
Lights, cab and classification	...	1	1	5	2	1
Lights, headlight	1	2	2	1	1	3
Meters, volt and ampere	2	2	3	2	...	4
Motors and generators	12	14	14	16	16	12
Pilots and pilot beams	1	2	4	10	12	10
Plugs and studs	1	...	...	...	...	...
Quills	29	18	9	6	...	4
Rods, main, side, and drive shafts	3	10	...	2	4	2
Sanders	50	59	41	57	56	34
Springs and spring rigging, driving and truck	38	44	18	35	58	50
Steam pipes	6	3	1	...	1	4
Steps, footboards, et cetera	28	25	25	21	35	22
Switches, hand-operated, and fuses	7	2	2	2	2	3
Transformers, resistors, and rheostats	...	...	3	3	3	1
Trucks	42	47	22	28	30	43
Water tanks	2	1	4	1	1	...
Water glasses, fittings, and shields	2	4	2	5	1	1
Warning-signal appliances	...	2	3	3	4	...
Wheels	46	74	107	43	28	22
Miscellaneous	16	13	16	14	8	15
Total number of defects	1,212	1,026	849	926	905	766
Locomotive units reported	6,094	5,139	4,351	3,957	3,389	2,987
Locomotive units inspected	9,888	7,711	6,847	6,728	5,558	4,974
Locomotive units defective	447	378	298	358	319	298
Percentage inspected found defective	4.5	4.9	4.4	5	6	6
Locomotive units ordered out of service	16	9	6	12	21	16

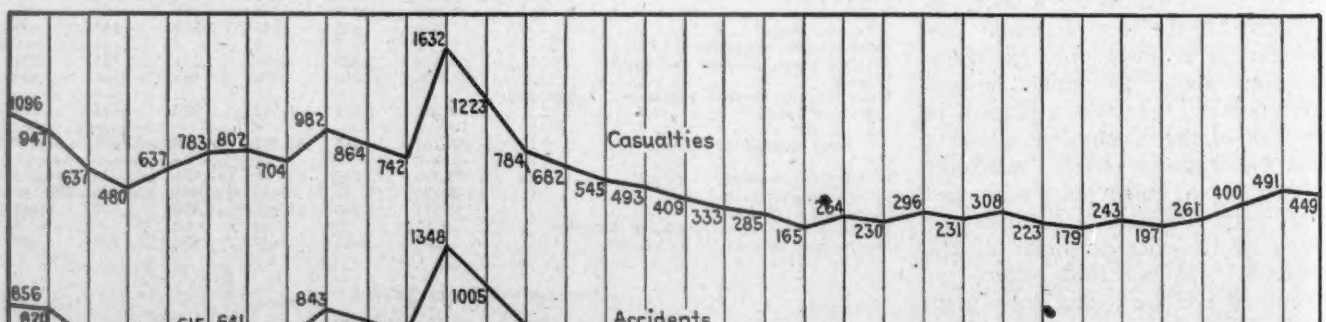
cent in the number of persons killed, and 33 per cent in the number of persons injured compared with 1942; a reduction of 27 per cent in the number of explosions, 18 per cent in the number of persons killed, and 59 per cent in the number of persons injured compared with 1941. These statistics represent a decided improvement in the safety of employees and travelers, but recurrence of explosions caused by overheating of crown sheets indicates that efforts, the futility of which should be recognized in advance, are continuing to be exerted to avoid delays that would occur if the rate of working of the locomotive was reduced or the train stopped until a safe water level could be restored, or the fire dumped or extinguished.

Over Anxiety to Prevent Delays

Explosions on the line of road caused by overheating of crown sheets due to low water are the result of either over anxiety to avoid stalling, stopping of the train, or loss of running time; or unintentional lapse of the necessary vigilance normally exercised in the maintenance of safe water level probably brought about in most instances by attention being diverted to some unusual condition in operation of the locomotive or train which may appear at the time to be of paramount importance.

Efforts beyond the scope of their assigned duties are often voluntarily assumed by practically all railroad employees in attempts to keep trains moving and on time as nearly as this is humanly possible. Such efforts should be made only if they can be carried to conclusion without introduction of hazard to life, limb or property. Attempts to maintain steam pressure by trading a safe water level for steam and supply fuel to the fire to keep up the steam pressure when the water level in the boiler has receded to where it is not visible in the water glass, or, if visible, is so low that part of the crown sheet will be uncovered if the locomotive is headed upward on an ascending grade, can result only in accidents of the character described above. The operating rules of all railroads contain instructions, applicable to any condition of train or locomotive operation that may arise to the effect that in case of doubt the safe course shall be taken. The only safe course in the prevention of explosions caused by overheating of crown sheets is to maintain the water level so that it is readily visible at the proper height in the

(*Continued on page 120*)



The relation of defective steam locomotives to accidents and casualties resulting from locomotive failures—Prior to October 11, 1915, these figures were confined to locomotive boilers only

The Maintenance and Operation of

Diesel Electric Locomotives*

By Guy F. Wiles †

THE extensive introduction of Diesel-electric locomotives into railroad service created several new problems in maintenance. The steam locomotive as it is today was developed over a long period and mechanics on the majority of railroads received their training entirely on this type of power.

The introduction of cars with self-contained power units, first with gasoline engines with mechanical transmission and later with larger engines employing electric transmission trained a relatively small number of mechanics on some railroads in the maintenance of this class of power; and on most railroads when Diesel-electric locomotives were placed in service, these men were given special training on this type of equipment; some few were sent to the manufacturers' school, or factory, and these men supervised and instructed the mechanics assigned to this work.

When a locomotive leaves the factory and moves one mile its parts have worn to some degree and as it operates additional mileage, its parts wear more, so that maintenance is not just a matter of replacing of worn parts but is the science of developing inspections of all parts at specified periods; of tests to develop when parts have reached limits that have been found to be safe; to prevent the failure of them in service, and the repairing and replacing of those parts.

The high initial cost of the major tools used in railroad transporation, such as locomotives and cars, eliminates any possibility of discarding them after a short period of service for newer models on account of being worn out. This applies particularly to large Diesel locomotives.

The Baltimore & Ohio placed one of the first Diesel-electric switching locomotives in the United States in service in 1925 on a freight pier in New York City, where it is still operating. The first Diesel-electric road locomotive in regular service in the United States was on its lines in 1935, when an 1,800-hp. passenger unit was placed in service between Washington, D. C., and Jersey City, N. J.; this unit is still in operation on the Alton.

The first passenger locomotives have operated approximately 2,000,000 miles and it appears their life will be several times this, with an economical operation.

All of these Diesel locomotives are assigned to obtain maximum service from them. Since being placed in service, the passenger locomotives have averaged 19,663 miles per month, the freight locomotives have averaged 10,994 miles, and the switching locomotives have been available for service 95 per cent of the time and have been in service 88 per cent of the time.

When these locomotives were first assigned to specific trains with schedules suited to this type of power, it was soon developed that it was possible to perform the majority of maintenance work during the regular layover between runs or, in the case of switching locomotives, during one day each month.

This scheduling of repairs has also helped to keep a regular number of mechanics assigned and prevented the necessity for a larger number at certain peak periods.

The passenger locomotives on the B. & O. operate between Washington, D. C., and St. Louis, Mo., Chicago, Detroit, Mich., and Jersey City, N. J., with the regular maintenance assigned to Washington, D. C., Chicago and St. Louis, Mo. Three of the freight locomotives operate between Willard, Ohio, and Philadelphia, Pa., and three between Cumberland, Md., and Washington, Ind.

All heavy repairs to these locomotives are made at the Mt. Clare shop,‡ where extra Diesel engines, main generators, and trucks are on hand. Facilities are available for making heavy repairs, including a portable resistance unit by which any of the Diesel engines and generators are tested under full load. Traction motors and auxiliary generators removed are sent to the Mt. Clare shop, where all repairs are made, except for armatures requiring rewinding and crankshafts requiring grinding, which are sent to outside service shops. Experience is teaching that it will be necessary to provide more materials and equipment to make major repairs to the underframe and body members of these locomotives to eliminate unnecessary time out of service when accidents occur.

One million miles has been set as the period for shopping for general heavy repairs for passenger locomotives, 500,000 miles for freight locomotives and five years for switching locomotives for heavy repairs. These periods may be changed as more experience is gained.

The lubrication of the Diesel engine is one of the major items that contribute to their successful and economical operation and this is closely followed on these locomotives. A daily test is made of the viscosity and a blotter test is made to determine how dirty the oil is. The filter elements are renewed at regular intervals or whenever the tests mentioned indicate the necessity.

The lubricating oil removed is shipped to Mt. Clare shop where it is refined under the supervision of the engineer of tests, after which it is used again the same as new oil in the same service from which it was removed. A close check is kept on the quantity of the fuel oil used to assure that it meets specifications. Filters have been installed at several of the fueling stations and others are to be installed as their use has been found beneficial.

Because of the multiplicity of parts on this type of locomotive, keeping records is one of the most important factors in maintenance for the purpose of scheduling the inspection and renewal of parts. This feature is closely followed, and specially trained clerks have been assigned at principal repair points to keep these records. To date there has been no standardized classification of Diesel-electric locomotive repairs similar to that for steam locomotive repairs. This is being studied, and the establishment of such classification will be helpful for comparative purposes.

The cleaning of Diesel-electric locomotives and their equipment is very important and requires considerable labor, especially when steam helper locomotives are used, as is done on the B. & O. over the Allegheny Mountains. Large capacity vacuum cleaners are used, but there are many problems in cleaning on account of the contour and location of the various appurtenances, and also on account

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* Abstract of a paper presented before the Southern & Southwestern Railway Club, Ansley Hotel, Atlanta, Ga., November 15, 1945.

† Supervisor, Diesel-electric locomotive operation, Baltimore & Ohio.

‡ See the *Railway Mechanical Engineer*, April 1944, page 154.—Editor.

Recapitulation of Diesel Passenger Failures and Delays
January 1, 1942 to September 30, 1945

	Trac. motor and main generator	Traction motor bearing	Electrical control	Piston and cylinder liner	Cylinder head	Cover plates	Engine bearings	Lubricating system	Cooling system	Belt drives	Injectors & fuel system	False hot journal alarms	Jour. boxes and bearings	Brake rigging	Wheels and axles	Truck springs and hangers	Train control	Air brake equipment	Boiler	Piping	Draw gear	Headlight	Sanding equipment	Engine accessory	Governors	Drive gears and pinions	Crankshafts	Gear covers	Operation	Traffic	Total
1942	22	7	20	38	14	5	4	6	7	3	5	17	5	7	..	1	11	21	12	17	2	..	3	7	6	1	1	..	8	..	250
1943	17	1	5	34	4	..	..	1	2	1	5	25	1	3	..	..	11	9	3	14	..	..	3	..	..	..	..	1	1	..	141
1944	18	3	7	14	5	1	..	..	3	1	4	5	2	1	..	..	9	3	..	7	..	..	..	1	3	1	..	..	..	..	88
1945	13	2	5	7	2	3	1	4	3	..	1	3	2	..	..	1	10	4	1	6	..	..	..	..	1	1	..	..	..	..	70
1944	2	..	1	..	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6
Jan. 1945	1	..	..	1	1	..	..	2	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	7
1944	2	..	1	2	..	..	..	..	..	..	..	2	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	10
Feb. 1945	1	1	..	1	..	..	..	1	..	..	..	2	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	9
1944	2	..	..	3	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	1	..	..	..	..	..	..	9
Mar. 1945	3	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	2	..	..	2	..	..	..	..	..	..	..	..	..	..	9
1944	3	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	7
Apr. 1945	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	3
1944	2	..	..	..	..	1	..	..	..	..	..	1	1	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	7
May 1945	1	..	1	1	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	6
1944	1	..	..	2	..	..	..	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	8
June 1945	1	..	2	..	..	..	1	..	1	..	..	..	1	..	..	..	5	..	..	..	..	..	..	..	1	..	..	..	..	..	12
1944	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	2	..	..	..	..	..	..	..	..	..	..	6
July 1945	2	..	..	2	..	2	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	7
1944	..	1	1	4	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	9
Aug. 1945	1	1	1	..	..	..	..	..	1	..	..	..	..	..	..	1	2	2	..	..	..	..	..	..	..	..	..	..	..	..	9
1944	3	..	..	..	2	..	..	..	..	..	..	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	8
Sept. 1945	2	..	..	2	..	1	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	8
Total current Year	13	2	5	7	2	3	1	4	3	..	1	3	2	..	..	1	10	4	1	6	..	..	..	..	1	1	..	..	..	..	70

Office general superintendent motive power and equipment, Baltimore, Md., Oct. 22, 1945.

of the presence of considerable electrical equipment. However, the manufacturers of various cleaning materials are developing improved methods and tools for this.

The successful operation of Diesel locomotives and their maintenance depends upon having properly trained supervision and workmen, and that a definite plan of daily, monthly and annual inspections be carried out, on a properly planned program of maintenance. It is also important to keep an accurate record covering the failures of the various parts so that proper consideration can be given by the engineering department of the railroad, as well as the manufacturer, so as constantly to bring about improvements in design. An accurate record should also be kept of the delays that occur on the road, properly classified, which record will indicate definitely where maintenance or design should be improved. It is also important that proper tools be on hand, as well as sufficient material so that permanent repairs can be made promptly.

As an example of what has been accomplished on the B. & O. by maintaining such records, since 1942 delays of three minutes or more to passenger trains operated with Diesel-electric locomotives have been reduced from 250 during 1942 to 141 during 1943; 88 during 1944 and 70 to date during 1945. This decrease in failures and delays has been made notwithstanding an increase in the number of units operated.

Last, but not least, while it is admitted that the supervising personnel should be thoroughly acquainted with the Diesel locomotive, it has been our experience that the Diesel locomotive should not be considered as a special piece of equipment, but should be handled just the same as any other piece of equipment, by the regular mechanical force, and they in turn properly instructed and educated in the handling of their work.

Discussion of Mr. Wiles' Paper*

Q.—What type of work are you doing at Willard, Ohio?

A.—We are doing the daily regular run of maintenance, outside of heavy repairs. Any heavy work is handled at the Mt. Clare (Baltimore, Md.) shop.

Q.—In the event it is necessary to add to Diesel maintenance forces either at Willard or Mt. Clare, what kind of restrictions do you place on a man going from steam locomotive work? Do you set up any qualifications for that type man?

A.—He bids in by seniority and they must be able to perform the work.

Q.—About what percentage are electricians and what percentage machinists?

A.—Forty per cent electricians, 60 per cent machinists.

Q.—I understand that, on the B. & O., you have exacting service performed by Diesel locomotives. When units come in, can you tell us about how many mechanics, machinists and electricians are sent with those units to prepare them for the next trip?

A.—One machinist to each unit and one electrician to two units can keep up the work and then we have a general man assigned to about four locomotives for outside truck work.

Q.—Is this the same on freight locomotives as on passenger?

A.—We figure two machinists for each freight unit.

Q.—You use two men in taking care of 16-cylinder locomotives?

A.—Yes.

Q.—What is the cost of locomotives repairs, including running repairs and all extra parts?

A.—Passenger, 2,000 hp., per mile, about 12½ cents per mile per unit; freight, 5,400-hp. locomotive, 40 cents per mile; switching, about five cents per mile.

Q.—What system do you use to keep complete data on running repairs?

A.—All records are kept at Washington, D. C., and all

* In the discussion of the paper a number of questions were asked by members from the floor; all were answered by Mr. Wiles. A number of these questions and answers have been selected for presentation here and arranged according to the subject matter.—Editor.

work performed is reported to us and also to Washington.

Q.—Do you make a daily inspection on switching locomotives? How many men do this?

A.—One machinist and one electrician.

Q.—On the maintenance of passenger locomotives, what is the percentage of electricians and machinists?

A.—About 20 per cent electricians and 80 per cent machinists.

Q.—What is the justification for continuing the traveling supervisor?

A.—We profit by the report from that man and from the adjustments he makes of things that occur enroute that would otherwise cause us serious delay.

Q.—To what extent do you have traveling maintenance supervisors riding on the locomotives?

A.—On the B. & O. we use what we call Diesel supervisors on all locomotives, both passenger and freight. One rides every trip.

Q.—Could you tell us anything about the number of failures caused by fires?

A.—Regarding fires, we have not had what you would call disastrous fires. We have had very little damage caused by fire; of course, we have had some fires from time to time but not very much damage. We keep constantly after it, cleaning equipment continually, and we have not had a whole lot of trouble.

Q.—How many hours of service does the million miles represent?

A.—The million miles represents approximately 25,000 hours.

Q.—You mention main bearings watch dogs. It brings to my mind the questions of main bearing inspection. How close do you follow the 100,000-mile inspection?

A.—We try to get them out every two months. About 50,000 miles.

Q.—If the inspection discloses the bearing to be good, do you put it back in service?

A.—Yes, regardless of age.

Q.—Do you let the inspection of the bearing govern the renewal of the bearing?

A.—We do not renew on an age basis but on inspection only.

Q.—What are the qualifications for the so-called supervisors?

A.—The same as any supervisor. The master mechanics recommend men they think will qualify and we give them special training and they must qualify on the instruction car and then on the road. It takes some men one month to qualify and some more than two months; they are never given less training than one month.

Q.—What type of fire protection do you have?

A.—Carbon tetra-chloride pump and pressure type fire extinguishers; we also have emergency hose hooked up to the boiler water pump.

Q.—You mention the mileage of freight power—in the 2,000-mile inspection how much time is spent in between in running repair inspection? At the end of each trip?

A.—We divide up each trip. In this case the ones at Willard have gone about 1,200 miles; others run about 1,300 miles.

Q.—Do they only get repair inspection at the 1,300-mile limit?

A.—Yes, but it wouldn't take much longer for 1,500 or 2,000 miles.

Q.—Do you contemplate extending the use of supervisors? Are you going to put supervisors with freight locomotives as well as passenger locomotives?

A.—Yes.

Q.—How are freight runs divided?

A.—Three of our freight locomotives operate between Willard and Philadelphia and three operate between Cumberland, Md. and Washington, D. C.

Q.—What about wheel life and if you balance wheels?

A.—We have averaged 100,000 miles between wheel changes on passenger locomotives. We do not balance wheels.

Q.—On freight locomotives do you have 40-in. wheels? How far do you turn that wheel down?

A.—I. C. C. limit; our freight locomotives have 40-in. wheels.

Q.—Have you taken into consideration the fact that you could get out of step as much as 3 in.?

A.—We try to keep like diameters together.

Q.—What percentage of Diesels are taken out for sharp flanges and what method is best to reduce flange wear?

A.—We have no flange oils on passenger or freight locomotives but we do on the switchers.

Q.—What experience have you had with tires on Diesels?

A.—We use only solid wheels.

Q.—Do you think it good practice to turn the wheel down after you have gotten use of it and put tires on it?

A.—No.

Maintenance of Diesel Engines

Q.—Do you remove cranks from the engines?

A.—We have had several engines go 1,000,000 miles, and that is what we are aiming for.

Q.—In overhauling Diesel locomotives at Mt. Clare shop about what length of time do you keep the unit in the shop?

A.—We have trucks, extra engines and main generators there—I would say from two to three weeks—it is governed by the wiring and body work.

Q.—Do you use chromium plated liners on any locomotives?

A.—Yes, they give good service.

Q.—When you remove two engines, do you have a room to put them in to disassemble them and then another room to assemble them in?

A.—We remove them where we disassemble steam locomotives and take them to cleaning vats. We have a separate room for assembling Diesel engines.

Q.—How much over a million miles do you run an engine before removing the crankshaft?

A.—That is determined by inspection of the main bearings. The oil pressures gives a pretty good idea.

Q.—You do not "mike" the bearings?

A.—No.

Q.—Suppose an locomotive comes in that has made 1,500,000 miles and has a frozen bearing on a traction motor. Can you tell whether it froze for lack of lubrication or over-lubrication?

A.—No, you cannot tell. I might add you can't tell whether it is over- or under-lubrication or is due to the bearing failing.

Q.—You mention a portable test set. How much stress do you put on inspection or checking locomotives with this test set?

A.—I can hardly put too much stress on it. It saves you from making trial trips. Full-load tests of engines can be made and the condition of the power plant can be determined.

Q.—Do you use the same load tester for all engines.

A.—We use it for all freight, passenger and switching locomotives.

Q.—Is piston removal set up on a mileage basis?

A.—Yes, 150,000 miles.

Q.—Do you have any special time for renewing radiator hose?

A.—Just by inspecion. Those close to the exhaust pipe should be renewed every three months.

Q.—Do you use sintered bronze piston thrust washers?

A.—No, all sintered bronze washers are out of service; we had breakages attributed to it.

Q.—You find that copper greatly minimized defective pistons?

A.—Yes, that is right.

Electrical Equipment

Q.—What do you use to clean around the generator?

A.—Carbon tetra-chloride.

Q.—Will you elaborate on the cleaning of the interior and the exterior?

A.—On passenger locomotives it takes two cleaners on the interior and one on the exterior during an eight-hour layover.

Q.—Are traction motors fully inspected—liners and everything? Then, if the liners have to be put in and more work done, do you call in other additional mechanics?

A.—Yes, if it is necessary to change traction motors.

Q.—How many additional mechanics would you call in?

A.—A separate gang changes traction motors.

Q.—You stated that you had extra equipment, two motors for one unit, and it takes three weeks to transfer material. Do you think you gain anything by that?

A.—By having this extra equipment you reduce the number of men and the time in the shop.

Q.—You say you do not match gearing; is it not essential or are you just not able to get to it?

A.—We have never considered it essential. However, the manufacturers are attributing some motor winding failures to it. We are studying the question now.

Q.—Evidently vacuum impregnating and dynamic balancing is essential?

A.—Yes.

Q.—Is it advisable to put the high potential test on control circuits and what is the benefit?

A.—You naturally have to put it on if it is in for heavy repairs; has trouble you cannot find or when I. C. C. rules require it. We use the megger and clear it up. So far as putting the high potential on regularly, I think you would just be asking for trouble. That has been our experience.

Q.—Is there any regular procedure for removal of traction motors, or inspection of armatures?

A.—About 250,000 miles on passenger engines and 200,000 miles on freight. We try to work it in with the wheel changes.

Q.—In your list of causes for failure you fail to mention the Diesel cranking battery.

A.—We have never had a failure on the road from that cause.

Q.—How is it you have not had a failure? How have you avoided these failures?

A.—By close inspection and good workmanship. We also connect the two battery systems together by electric cable.

Q.—Do you consider battery inspection part of the Diesel work?

A.—Yes.

Lubrication

Q.—In the event of dilution of lubricating oil by fuel oil or the viscosity being dropped, do you make main bearing inspection at that time?

A.—No.

Q.—You don't make inspection at three per cent dilution?

A.—No.

Q.—I was very much interested in what you said about using all re-refined oils. We had a case where the oil turned acid in 600 hours.

A.—We drain the oil and we use different makes of oils. It is tagged and goes back to the same point from which shipped and into the same service. At one point, on account of changing oil, we have been using nothing but re-refined oil for changing and adding in switching service for more than a year. We have had no bad results.

Q.—In crankcases, have any cracks developed between the lubricating oil channel and the water?

A.—No.

Q.—In the matter of oil failures did you attribute any failures to hot oil?

A.—Yes.

Locomotive Defects Checked

(*Continued from page 116*)

water glass, reducing the rate of working of the locomotive to accomplish this if, from any cause, water is being used at a rate in excess of that at which it can be supplied to the boiler. The water level shown in the water glasses should be under practically constant observation, the glasses should be blown out sufficiently often during each trip, and movement of the water in the glasses carefully noted at that time and thereafter, to insure that the level in the glasses moves freely with the water level in the boiler which is subject to practically constant motion over a narrow range when the locomotive is working. Gage cocks should be tried frequently to check the level in the water glasses.

If observation of the water level has been inadvertently overlooked until the level has receded below the lowest reading of the water glass, or proportionately higher if the locomotive is headed upward on an ascending grade, the fire should be dumped or extinguished at once irrespective of whether the discharge from the lowest gage cock may be construed as indicating the presence of water.

A false sense of security is sometimes brought about by closing the top waterglass cock in attempts to find water when it is so low that it is not visible in the water glass. Under some conditions when the top water-glass cock is closed, the glass will promptly fill with water when water is absent from part or all of the crown sheet. Indulgence in this practice and that of interpreting a flutter of water from the lowest gauge cock as indicating a sufficient depth of water on the crown sheet to protect it from overheating have caused many explosions. The lowest indication of any of the water level indicating devices when observed in the normal manner should be controlling; in other words, the least favorable should be considered as the correct indication. Artificial or trick means should not be used to induce assumption that there is sufficient water in the boiler to protect the crown sheet from overheating.

Boiler and appurtenance accidents other than explosions resulted in the death of four employees and injuries to 142 employees; this is a decrease of one death and an increase of 10 injuries as compared with the preceding year.

Extension for Flue Removals

Of the 1,729 applications filed for extensions of time for removal of flues, 43 could not properly be granted because of the conditions of the locomotives, 36 were allowed extensions for shorter periods than requested, 40 were granted after defects were repaired, 57 were canceled, and 1,553 were granted in full.

Locomotives Other Than Steam

The number of accidents occurring in connection with locomotives other than steam increased by 12 and the number of persons injured by 17 as compared with the preceding year. One employee was killed; this is the only death as a result of these accidents since 1931.

During the year 4.5 per cent of the locomotives inspected were found with defects or errors in inspection that should have been corrected before the locomotives were put into use; this represents a decrease of 0.4 per cent compared with the results obtained in the preceding year. Sixteen locomotives were ordered withheld from service because of the presence of defects that rendered the locomotives immediately unsafe; this was seven locomotives more than during the next preceding year.

Under rule 54 of the Rules and Instructions for Inspection and Testing of Steam Locomotives, 331 specification cards and 5,767 alteration reports were filed, checked, and analyzed. These reports are necessary in order to determine whether or not the boilers represented were so constructed or repaired as to render safe and proper service and whether the stresses were within the allowed limits. Corrective measures were taken with respect to numerous discrepancies found.

Under rules 328 and 329 of the Rules and Instructions for Inspection and Testing of Locomotives Other Than Steam, 1,045 specifications and 120 alteration reports were filed for locomotive units and 228 specifications and 166 alteration reports were filed for boilers mounted on locomotives other than steam. These were checked and corrective measures taken with respect to discrepancies.

Special Work

In response to requests from military and naval authorities and other government agencies engaged in the war effort, inspections of various locomotives were made to determine the condition and suitability for use, and cooperative assistance was rendered in other respects. These locomotives are being generally maintained to the standards prescribed by the locomotive inspection law and rules governing the condition of locomotives used on the lines of common carriers, and inspections are currently made by the Bureau's inspectors.

Passenger Car Design Considerations

(*Continued from page 112*)

Side sills and the center sill have other values too. We can hang stuff on them and that is getting to be more important all the time. In fact, it is almost a question whether we are designing cars nowadays for the passenger or for more equipment. You may find a vacant seat or an empty berth some day, but I defy you to find an empty cubic foot of space under the car or in the roof. Batteries are one big problem. They weigh some 7,000 lb., including the box. That alone is two-thirds of the passenger load including baggage. Air conditioning and the electrical installation account for another 8,000 lb. Water weighs a ton. If you wanted to ship that water by freight, it would cost you just about as much as the child you take with you at half fare. Of course, your child wouldn't weigh quite that much. But then, speaking of tons, a fully loaded coach—and they sure are fully loaded today—carried a ton of weight for every passenger carried. The average tariff per ton mile in freight is about one cent. So the railroad collects two cents a mile from you and donates one cent of it back to hauling the equipment which it supplies for your benefit.

A Better Ride?—A Pessimistic View

So far I have talked chiefly of the car structure and, as I have said, it constitutes about one-third of the total car weight. The trucks account for another one-third and they are blamed for a lot of the deficiencies of riding comfort. I wish I could picture a better time to come. Actually we are trying to provide such, but you are not going to enjoy it immediately. I don't know that you ever will. The most progress which we have made is to design a truck which requires less maintenance. You have possibly noticed that often a car rides beautifully, and again a car of the same type will be nothing but a torment. This is purely a matter of truck maintenance. Today there is no time nor skill to maintain trucks. Maybe—like courtesy—that will eventually return to us.

Actually the average passenger cannot distinguish between the discomforts of motion and that of noise. So the latter is something which we can do something about, and will, and a thing which does not depend upon a continuous maintenance. Once it is built it will stay there. Noises are those of loose parts which can be corrected, and the air borne noises which can be dampened. Among the latter is the sound of the rails. Any boy will tell you how he can clamp his ear to a rail and hear a train half a mile away. Well, under each coach there are 170 feet of rail. How much must they be singing as the car passes over them?

Brake screeching is another source of annoyance. You wouldn't allow it in your automobile. You don't like it when a few rivets which hold the lining happen to get in contact with the brake drum, and yet railroad cars since time immemorial have been stopped by a metal shoe applied against a metal rim of the wheel.

And, we have tried to do something about that. The Budd Wheel Company has designed an automotive type of braking for railroad cars. So far about 200 cars have been equipped with it. They not only brake smoother, but they brake in shorter distance and especially from the higher speeds.

But, as I have said before, railroad cars are built around the appointments. We do have to have windows where they belong according to the passengers, and if the water cooler interferes with a structural member it is the structure and not the water cooler which goes out. After all, the purpose of all new equipment is to attract and to keep the trade. If we have to build a pent-house into a structural roof, well, that is only another engineering headache, but if it keeps the passenger happy, it is well worth while and aspirin doesn't cost very much. After all, if everybody stayed put and we had no changes, engineers wouldn't be well fed nor happy.

Then as for the railroads, they too have a job to do. They have got to learn that travel is a commodity and has to be merchandised as such. They had better forget the airways and the highways as competition and figure them in as just part of the general travel picture. They had better concede that the airways can offer speed and that the bus will always be cheaper. In fact, the railroads should stick to their knitting. Actually they have a very strong argument. They can offer a thoroughly relaxed travel and not the least feature of this relaxation is the feeling of being perfectly safe, for, according to the American Safety Council, you are sixteen times safer on a railroad train than you are on the highway in your own automobile, or in a commercial airplane.

I haven't the figures as to where you would rate in your own bathtub.

High-Speed Truck Development*

By V. L. Green†

When the Chicago, Milwaukee, St. Paul & Pacific built its first streamlined Hiawatha in 1934 more attention was paid to the body construction and its appointments than anything else on the car. The first streamliners were equipped with a conventional four-wheel truck for no better reason than it was the only thing available at the time. This truck is what is known as an equalized truck with helical and elliptical springs and approximately 6 in. of deflection from free to riding height. This truck has only mediocre riding qualities, particularly at speeds above 85 m.p.h.

In 1935 the management recognized the need for research and development of passenger car trucks if passenger comfort was to be attained at speeds above 85 m.p.h. After extensive tests of various designs, it was decided in 1937 to try to improve riding qualities by the introduction of coil springs under the truck bolster. In 1938, a test truck was built embodying the coil bolster springs, snubbers and levelator bars, but eliminating the equalizer and equalizer springs. They were replaced by coil springs over the journal boxes. This truck rode nicely up to 85 m.p.h., but above this speed the truck frame galloped. At a speed of 110 m.p.h., the tail pieces of the truck hit the center sill, meaning 6 in. vibrations. The truck frame was so constructed that an equalizer could be applied. When the equalizers were applied the truck rode well in all respects except for lateral, which was the same as the old conventional four-wheel truck. Forty-two car sets of these trucks have been in Hiawatha service since 1938 and proved relatively easy and inexpensive to maintain.

Improvements Culminate in 1942 and 1946 Trucks

The 1942 truck included all the improved features of the 1938 truck, such as rubber insulation, coil bolster springs, levelator bars, bolster drawbars, center plate insulation. To further reduce the number of friction surfaces and increase safety, pedestals were eliminated and cast steel equalizers designed with extended ends to engage the journal boxes. The truck was kept in tram or square by the application of drawbars on the sides and ends of the truck. The conventional swing hanger system was retained so the lateral characteristics were the same as in the conventional truck.

This truck has proven to have excellent riding qualities over an extended maintenance period. Its riding qualities do not deteriorate with the length of time that it is in service. It has proven easy to maintain and exceptionally safe in operation. In one instance of a broken axle at 93 m.p.h., the large cast steel equalizers formed skids for the truck to slide on, as well as holding the truck together. In this case the car was restored to service for an expenditure of less than $200, including the broken axle.

The war prevented further experimenting, but the Milwaukee has a new experimental truck being delivered early in 1946 which will be similar to the 1942 truck except that bolster springs will be outside of the center line of the journal. It will be equipped to operate with or without swing hangers. If the swing hangers are used, they will be only 10 in. long and have no rake.

After ten years of experimental work on passenger car trucks, it is obvious that the job is far from complete, but definite strides have been made. The Milwaukee has 70 car sets of trucks with superior vertical riding qualities, low noise level, and superior safety features. There has been no progress with lateral characteristics since 1870, but now that the other aspects have been brought up to a satisfactory level, the lateral can be given 100 per cent attention and a few years should see passenger car trucks with greatly-improved lateral riding qualities.

Lessons from Ten Years of Milwaukee Experience

(1) High-speed passenger car operation begins above 85 m.p.h. Below this speed, ground wheels and good track maintenance on conventional four-wheel truck will give satisfactory results.

(2) No high-speed truck of any design will function properly with wheels that are eccentric more than .020 in.

(3) The vertical riding qualities of a truck are a function of spring deflection. The bolster spring of a high-speed truck must have a sensitivity ratio (spring rate divided by the load carried) of not more than .15, preferably .10.

(4) The truck must have two spring systems, namely, primary and secondary systems. The equalizer springs system must not have a sensitivity ratio lower than .25, or spring surging will result. Springs of high deflection cannot be set down on completely unsprung parts without spring surging. A rule of thumb is that the equalizer spring deflection should be not more than ½ that of the bolster.

(5) The truck must have equalizers, or truck frame gallop will result if operated above 100 m.p.h.

(6) Friction surfaces should be reduced to a minimum.

(7) Car-body-roll stability is a function of the square of the lateral spread of the bolster spring.

(8) The value of swing hangers, especially long ones, is badly overrated in producing a good lateral ride.

(9) Vibration dampers and insulators are necessary to give a quiet car body.

(10) Bolster springs should be placed as high as possible to reduce instability.

(11) Wheel base is not a function of good riding either vertical or lateral.

(12) Wheel shimmy is caused by the taper of the worn wheel metal and is not a function of the shape of the tread when new. Wheel shimmy cannot be controlled by truck design, snubber or other devices. What causes a wheel to wear a critical shimmy tread is not known. The Milwaukee has one truck design that is not plagued with this phenomenon while all the others at times will develop wheel shimmy. There are so many differences between the truck designs that it would be impossible at this time to state the cause.

(13) High-speed passenger car trucks have excessive vertical amplitudes on rough branch line tracks when operated at low speeds. When designing branch line or suburban cars, high speed truck design should not be followed.

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* Brief abstract of a paper presented at the January 11 meeting of the Railway and Locomotive Society in Chicago.
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Out of the Horse's Mouth

Two enginemen overheard discussing a mutual friend:

"What's Hank doing?" asked one.

"Why, that's what I asked him yesterday," replied the other. "Said he's firing the Diesel side of No. 12."

"Now, what in hell does a fireman do on one of those things?"

"Hank says he helps the engineer."

"What does the engineer do?"

"Hank says he don't do nothing. They toss up to see who gets to blow the whistle."

D. & H. Wreck Train

Car department makes neat and efficient layout of the wrecking equipment throughout seven-car train — 250-ton crane added to train has capacity to make lifts of 220,000 lb. at a 28-ft. radius

THE Delaware & Hudson's car department has refitted its wreck train at Oneonta, N. Y., and equipped it with the tools and accessories needed for all conceivable wrecking and fire-fighting emergencies. In arranging the facilities in the cars, care and originality were exercised to facilitate getting them to the point of need quickly, and with as few men as possible. A 250-ton crane delivered in 1945 gives the train the capacity required to lift the 4-6-6-4 type locomotives acquired by the railroad in the last few years.

The train consists of a combination gondola and box car carrying ties, rails, and track tools; two converted milk cars, one containing tools, supplies, blocking, and a motor-generator set to supply electricity for lighting; the other loaded with the cables, slings, car replacers, jacks, and air hose; a fire-fighting car with a 7,800-gal. water tank; the 250-ton crane; a flat car loaded with car trucks and also acting as an idler for the crane boom, and a riding and dining car for the crew. A characteristic of the entire train is the orderly manner in which the tools and equipment are carried—bins and shelves are used for the small parts, brackets and hooks for suspending many of the hand tools, stands made of pipe for tools such as bars and jack handles, permanent blocking on the floors for jacks, open-top containers, and large cans, and special devices for the tools and equipment difficult to arrange conveniently by any of the normal storage methods.

Lighting plant, sheaves and blocking in the left side of second car—Bearings, workbench and miscellaneous stores in the right side

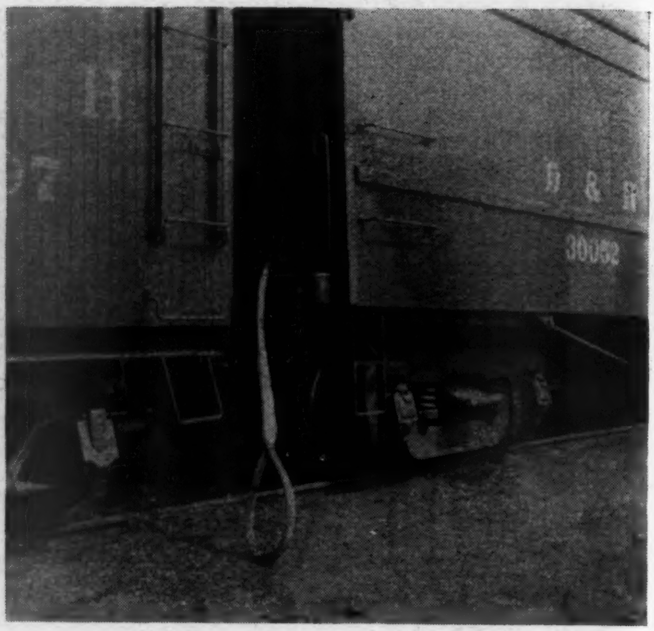
Track ties and tie plates are carried in the open end of the combination gondola and box car. The car has two floors with a distance between them just high enough to hold rails, 16 being carried in this space. Beams at each end of the car may be raised to permit the rails to be slid out when needed.

Stored in the enclosed part of the car are the track tools, electric lead lights, and emergency carbide lights. The lower of two shelves along one side is used for the track wrenches, adzes, and track sledge hammers, while the top shelf carries rail tongs and pick axes. Rail jacks and kegs of spikes are located under the shelves. Additional sledge hammers and all the shovels are suspended along the front wall and on the opposite side of the car. Track gauges, bars, spike pullers and brooms are located in stands at the corners of the car. Lead lights are carried in bins under the shovels, while the emergency carbide lights are on standards resting on the floor.

The first of the converted milk cars contains a variety of tools and equipment. A Kohler lighting plant model 1A21, fully automatic, is located in a corner of the car. It delivers the power for lighting throughout the train and starts automatically when a light switch is turned on in any one of the cars.

Along the side of the car to the rear of the motor generator set are four steel shelves carrying sheaves and accessories and behind the shelves are hundreds of wood blocking held in place by stanchions, the blocking extending to the door in the middle of the car. A heating

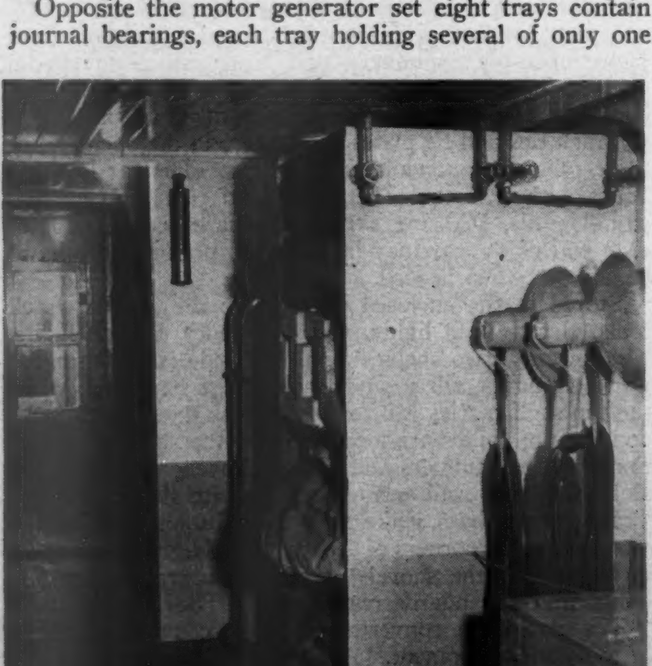
Cables and chains are carried uncoiled in center of third car; hand tools, air hose, rope and car replacers are in brackets



Uncoiled cables may be passed quickly through either of two small doors located near the floor at opposite diagonal corners

stove and coal box is on the other side of the door. Beyond the coal box a compartment with five shelves contains canvas, steel wire in rolls, L-shaped blocking, and car replacers. A pipe ring used in heating locomotive tires when setting or removing them is placed on top of the compartment, and between the coal box and the compartment is a space in which three electric floodlights are stored. Five tanks of oxygen are chained to a revolving stand on the other side of the compartment and two tanks of acetylene are stored along the wall.

Opposite the motor generator set eight trays contain journal bearings, each tray holding several of only one size. This arrangement is especially convenient as it eliminates any unnecessary hunting for a bearing of particular dimensions. First-aid stretchers are enclosed in a cabinet over the bearings. Next to the bearings is a work bench equipped with two vises and a miscellaneous assortment of machinist and pipe-fitting tools, the latter being neatly arranged in a cupboard over the bench. Bins extending from the floor to the ceiling and from the bench to the middle door hold small boxes of small items such as nuts, bolts, pipe fittings, cotter keys, and miscellaneous parts. Beyond the door are two sections of blocking, one with large and the other with small sizes.



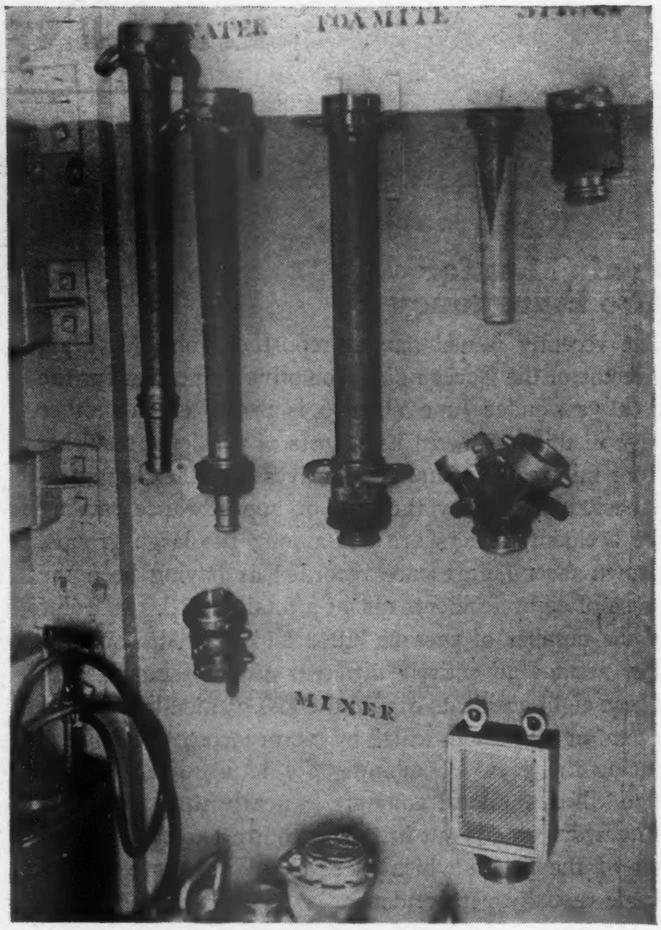
The oilroom is in the end of the second car

The end of the car opposite the electric power plant is partitioned off into an oil room. On one side is a large steel bin of journal-box packing, the bin having a valve for draining the oil so that it may be poured back on the packing. Four more carbide lights on standards are stored in the corner between the bin and the car end. On the other side of the oil room the dope pails, journal-box oil cans, carbide, crane grease and dry waste are blocked in place on the floor. Placed on shelves are cans of kerosene, valve oil, alcohol, and fuel oil, water pails, and inspector's lamps, all cans being painted blue and labeled. Packing irons are in pipe stands along the wall.

A feature of the second converted milk car is the ease with which the unwieldy cables and chains may be unloaded. They are strung on hooks attached to vertical steel posts running almost the entire length of the center section of the car. The uncoiled cables and ropes may be passed quickly through either of two small doors located near the floor at opposite diagonal corners. Less time is required for reloading the cables; it is more difficult to coil and load them when that method is used.

Air hose connections are hung on brackets attached to the wall along one side of the car, this hose being long enough to by-pass a crippled car in a train whose train line has been damaged. Car replacers are held in place by fixtures on the floor underneath the air hose. Brackets along the opposite wall support saws, axes, rope, acetylene hose, hammers, chisels, sledges, drifts, and pipe wrenches. On the floor under this equipment are located additional car replacers, hooks and U-bars for the crane, and bars and jack handles. Nine jacks of 15- to 50-ton capacity complete the equipment in this car.

Acetylene cutting outfit mounted in box underneath one side of sixth car; the tanks are on a rack that may be slid out when in use



Nozzles and Foamite mixer in fire-fighter car

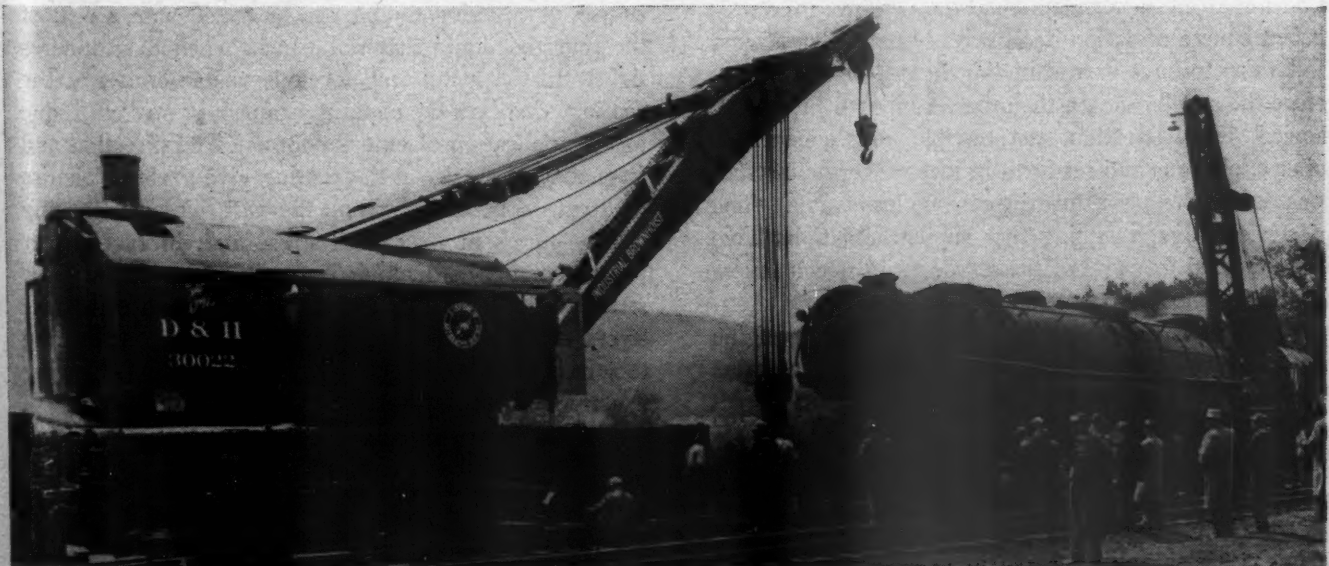
The fourth car of the train is fully equipped for fire fighting. A 7,800-gal. locomotive tender tank on one end of the car contains the water supply. Approximately 300 cans of Foamite are stored in the enclosed end of the car for use on oil or gasoline fires. The cans are held in place by removable bars. A device for feeding the Foamite into a hopper and mixing with water is bolted to the floor. Nozzles and hose fittings for various purposes hang on the side wall over the mixer while on the opposite wall two LaFrance-Wheeler Asbestos Fireman outfits for fighting emergency fires are suspended. A shield for protecting firemen from intense heat is included in the equipment. It is made of two steel sheets lined with asbestos to which two grab handles have been riveted for ease in carrying. The shield has four openings for hose nozzles and for peep holes. Four hand fire pumps complete the equipment.

The 250-ton Industrial Brownhoist wrecking crane has almost double the lift capacity of the 160-ton crane it replaced at radii at which most of the lifts are made. The main hoist can lift 220,000 lb. at a 28 ft. radius with all jack beams in position, 125,000 lb. with only the end jack beams in use, and 38,000 lb. without using jack beams. It has a 500,000-lb. lift at 17 ft. 6 in. and a maximum lift of 82,000 lb. at 38 ft.

Four sets of car trucks, couplers, drawbars, and extra cables and hooks are carried on the flat car that acts as the idler for the crane boom. A special feature of this car is an acetylene cutting outfit in a steel box underneath one side of the car. The acetylene and oxygen tanks are mounted on a frame that may be slid out of the box when in use and the hose is wound on a reel that is carried in one end of the box. This handy arrangement saves valuable time at a wreck and eliminates carrying tanks from the cars unless replacements are required.

The car used as a riding car for the wreck and train crews has adequate kitchen, dining room and sleeping quarters. A rearrangement of the car is contemplated by the railroad to provide additional accommodations. A searchlight is mounted on the rear platform.

The D. & H. has similar outfits with wrecking cranes of lighter capacity located at Whitehall, N. Y., Colonie, N. Y., and Carbondale, Pa., for use on other divisions.



EDITORIALS

Train Men for The Emergency

The recently issued annual report of John M. Hall, director of the Bureau of Locomotive Inspection for the fiscal year ended June 30, 1945, is abstracted on another page in this issue. In its reports of accidents resulting from failures of steam locomotives and their appurtenances, classified by the part or appurtenance causing the accident, boilers are not among the large groups. Crown-sheet failures are recorded as having been the cause of eight accidents out of a total of 410. In point of the number of persons killed and injured, however, they assume an entirely different order of importance. These eight accidents caused the loss of nine lives out of a total of 20 persons killed by steam locomotive failures during the year. Combining the 12 injured with the nine killed, the total amounts to nearly three per accident which stands out in strong contrast to the remainder of the list in which there is seldom more than a single casualty per accident.

No doubt it is for this and the added reason that these accidents always result in heavy property damage that Director Hall again devotes a major part of his annual report to the causes of these accidents in which he stresses as contributing factors the mental reactions of the men most concerned and on whom ultimate reliance must be placed for their prevention. This aspect of the situation has been under consideration for several years. No doubt owing to its intangible nature recognition of its full significance is slow in developing.

In three of the eight cases dealt with during the last fiscal year the evidence is clear that the engine crews were aware of the danger of their situation in time to have prevented the accidents had they followed the prescribed course of action decisively. Low-water alarms are known to have been sounding in two of these cases before the accidents. In the other, a placard in the cab showed, by illustration, the terrible consequences of boiler explosions and set forth in incisive terms instructions as to safe procedure in case of low water. The inference is overwhelming that similar situations have been involved in many of the accidents in which investigations disclose no contributory causes.

All men in train service, particularly the engine crews, are constantly on the alert to keep their trains moving and on time. As Mr. Hall points out in his report, voluntary efforts beyond the line of assigned duties are often put forth by practically all employees in attempts toward this end. On the other hand, day after day passes in which no difficulty is encountered in maintaining a suitable water level in the locomotive boiler. So, when the relatively rare case of difficulty in maintaining a safe water level occurs, the men in the cab are faced with a mental conflict in which the strong urge of habit weighs heavily against a prompt decision on the side of safety. Unfortunately, the decision must be made promptly if it is to be effective at all.

At first thought it seems inexplicable that men, aware of the danger of their position, will deliberately send themselves to death by failing to take the course of action which they know will save their lives. Further consideration of the matter, however, leads to the conclusion that only a strong-minded and decisive personality has much chance of coming through under these circumstances.

This condition can only be corrected by some form of positive training in advance of the emergency, sufficiently persistent in its impact to balance the deeply ingrained urge to keep the train moving.

Stress Analysis With Brittle Coatings

The use of various types of brittle coatings to indicate stresses in vital parts of railway locomotive and car equipment will doubtless be more common practice in the future than in the past. Much progress in the technique of this method of testing has been made under the impetus of war requirements and the method has shown great adaptability and value for studying not only static stresses but those due to dynamic loading in which the inertia effects are given full play.

Stress analysis by means of brittle coatings consists simply of covering the part to be tested with a coat of the required liquid material which, when dry, adheres tightly to the metal and develops visible cracks in the coating whenever the metal is strained, or stretched, due to the application of exterior force. The direction and frequency of cracks in the coating give a visual picture of stress conditions within the test piece, indicating clearly points of maximum stress and, in fact, under proper conditions, making it possible to evaluate these stresses within about 10 per cent. Where more accurate stress determinations are required, the brittle-coating test method saves much time and effort by showing exactly where to apply the wire-type strain gages.

Like every other test procedure, the brittle-coating method has certain limitations, the full appreciation of which is necessary for satisfactory results. Of primary importance is selection of a coating to give the desired sensitivity. Full control of temperature and humidity

under test conditions is essential. Due consideration must also be given to the action of individual coating materials when the test piece is subjected either to exceptionally slow application of static force or unusually rapid dynamic loading. Within a reasonable range, however, the speed of application of exterior force to the test piece does not seem to affect stress patterns developed in the coating material.

Many highly interesting, not to say astonishing things, have been discovered by the brittle-coating method of stress analysis. What layman, for example, would ever think that any machine part could be made stronger by drilling a hole in it. This actually happened when an internal-combustion-engine crank shaft was tested by the brittle-coating method and the point of maximum stress shown to be at the junction of connecting-rod bearing and crank-shaft cheek. By drilling a hole of the proper size in this cheek, which was already stronger than necessary, it was made more flexible and assumed some of the load formerly carried at the point of peak stress.

In one railroad test to determine why driving wheels sometimes work part way off the axles while in service, the four connecting rods on an articulated steam freight locomotive were given a coating of moderate sensitivity and covered with cellophane to protect them from dirt. Stress patterns appeared as a result of many cycles of operation and showed evidence of extreme vibration in a complex wave form whenever wheel slippage occurred.

It was concluded that excessive vibration shortened the effective length of the connecting rods when the wheels slipped up to high speed and trapped steam in cylinders first on one side of the locomotive and then the other. The result was rough operation of the locomotive and the transmission of extremely heavy shocks and forces through rod connections to the driving wheels. The solution of the problem was the application of pressure relief valves to the locomotive cylinders to avoid the development of excessive cylinder pressures when driving wheel slippage occurs.

This is but one example of many possible applications of the brittle-coating method of testing railway equipment parts, especially under dynamic loads and service conditions which are difficult or impossible to duplicate in ordinary laboratory tests.

Color in the Shop

Viewed objectively for its artistic values the full-page reproduction in color of the interior of the Baltimore & Ohio's Cumberland, Md., enginehouse machine shop, appearing elsewhere in this issue, probably would not receive more than a passing glance from an art critic. The picture represents such a startling change from the drabness typical of enginehouse interiors, however, that a more careful study of its significance will undoubtedly be made by those familiar with the interior decorations of railroad shops.

An editorial in the February, 1946, issue of the *Railway Mechanical Engineer* discussed the principles of dynamic colors and mentioned the considerations being given to the application of those principles in railroad shops and terminal buildings by progressive managements as a result of favorable reaction to the use of color in streamline trains and passenger stations. Although the use of a scientific combination of color and light was not the only improvement made at the Cumberland enginehouse machine shop, the experience with color at this facility has demonstrated in a practical manner the important contribution that color can make in brightening up the shop, in reducing eye strain and in attracting workmen's attention to safety hazards. Any one of these reasons should encourage the giving of more consideration to the use of color in the shops and a more general acceptance of its value.

The More We Spend The Less We Get for It

There is one thing to which railroad mechanical officers and supervisors having anything to do with the maintenance of equipment might just as well make up their minds first as last—that in the days to come the cost of conducting the operations of their department is going to increase so much, from one cause or another, that economies can no longer be effected by reducing forces alone. If there is any doubt in anyone's mind that it is going to cost money to save money all he needs to do is to make a comparative and detailed study of shop operation for the years 1940 or 1941, 1943 or 1944, and 1946. Here are three periods that represent pre-war conditions, the peak of war-time operations and the current post-war period.

Within the past month, in connection with a detailed study of the operation of the system wheel shops on three railroads in the eastern part of the country, we had occasion to attempt a comparison of the performance of these three shops with respect to each other. This is always a dangerous thing to try to do in railroad operations of any kind where they involve different roads because it so happens that even on roads in the same general territory conditions usually vary so much that the comparisons are of little value. To attempt such comparisons is, however, always worth while, for out of each attempt usually comes some statistical analysis that may point the way to an opportunity to make improvement.

Here is one such result: In 1941, in one of the three locations in question the shop turned out an average of 70 pairs of finished wheels each eight-hour day. The maximum monthly production was a little over 1,900 pairs of wheels. The average number of wheel pairs produced was .31 pairs per man-hour. In the peak month of the war period, in 1943, the production jumped 28 per cent over 1941 but the average number of wheel pairs produced dropped to .28 per man-hour. In January, 1946, after having spent almost $100,000 in mod-

ernizing this shop the production per man-hour has dropped to .23 pairs on a total shop output which has now dropped back to almost the exact level of 1941.

In this shop are four new machine tools and much new tooling equipment and even a casual observer—not necessarily an expert in analyzing shop operations—can see that the new equipment is not, in any sense, being used to capacity. So, the obvious question is: "What good did it do to spend the $100,000?" The answer seems simple: "With the old equipment the man-hour output would probably be considerably less than the low figure of today; with the new equipment there is potential capacity to increase production per man-hour if the shop management can correct the practices that are limiting that production under present conditions. Every shop supervisor knows exactly what those conditions are without being told.

Limits For Light

There is a rather well established opinion among railroad men that 15 footcandles is the upper intensity limit for satisfactory illumination in railway passenger cars. This seems a little strange, since the eye experiences no discomfort under outdoor lighting intensities of several thousand footcandles, and reading tests in which the subject selects his own intensity show a preference for values near 50 footcandles. Offhand, it might be thought that these men were rationalizing, trying to find a reason for keeping the power load down to an easy-to-maintain value. But the opinion is obviously sincere and there must be some other reason for it.

A reason is suggested in a talk made recently by Ward Harrison, Nela Park Engineering Division, Lamp Department, General Electric Company. In this talk he offered several propositions, basic to all lighting. One of these reads: "To double the brightness of a light source without discomfort, increase surrounding brightness ten times". Carried far enough, this would lead to a seeming paradox; i. e., if the brightness of the light source were increased sufficiently, the surrounding brightness would have to be greater than that of the light source. The converse of this proposition is that reducing light source brightness greatly increases comfort.

The second proposition states: "Discomfort from a light source of fixed brightness increases with its visible area". From these two propositions, it appears that a light source should be neither large nor bright—if it is in the visual field.

The third proposition reads: "For comfort, keep the ranges in brightness, particularly of adjacent areas in the visual field, within reasonable limits—10 to 1—if possible". The lighter colors now used in the interiors of passenger cars have done much toward meeting this requirement.

"Always have much more light on the work than at the eyes if possible", is the fourth proposition. Most of the modern car lighting installations conform quite well with this rule.

Proposition five says, "Each one of a row of similar light sources makes the same contribution toward glare". This adds emphasis to the importance of keeping light sources out of the range of vision.

The sixth proposition is a poser for car lighting. It is—"Mounting light sources high greatly reduces glare".

The seventh and last proposition is, "Comfortable lighting requires that sufficient footcandles should be supplied for easy seeing of indoor tasks. These levels are far above those for barely seeing".

The difficulties involved in meeting all these requirements in a passenger car are obvious. It is necessary to have considerable light, particularly since there is relative motion between a page of printed matter and the traveler's eyes. This must be supplied by low-mounted units which, if visible, apparently must be neither large nor bright. Perhaps with the low mounting and the necessarily long light source, or long row of light sources, the arithmetic of the first proposition would automatically make high illumination values bad lighting. On the other hand, it would appear that higher values would be permissible if light sources could be better concealed. At least, the situation offers a challenge to those who do not wish to accept a 15-footcandle limit.

Nobody Wants This Job

One of the minor problems of reconversion is the disturbing effect of the dislocations of personnel by the demands of the war. In railway shops, for instance, helpers were promoted to mechanics and laborers to helpers. In many cases it became extremely difficult to recruit enough laborers to keep up with the necessary servicing of cars and locomotives, not to mention the performance of the numerous tasks which make up shop housekeeping.

Now, as wartime activity has ceased, the situations thus created are in for readjustment. It is always difficult to restore old relationships which call for at least some demotions, and the cumulative effect of the readjustments is felt at the shop-laborer level. Apparently no one wants to be a laborer who by virtue of wartime dislocations has had a taste of something which he feels is better, either in financial return, improved working conditions, or both.

Of course, this situation is made more acute because, on the whole, probably less than half the men who left the railroads to enter the armed forces of the nation have returned to duty.

This is one of the natural results of the total warfare, which involves the civilian population almost as completely, though less dangerously, as it does the armed forces. Ultimately it will readjust itself on the basis of the abilities of the individuals.

With the Car Foremen and Inspectors

Discuss

Changes in Interchange Rules

Rule changes effective last January 1 are studied by the Northwest Carmen's Association at St. Paul—Winter problems of packing journal boxes are also discussed

A DISCUSSION of changes in the A.A.R. interchange rules, effective January 1, 1946, developed at the regular monthly meeting of the Northwest Carmen's Association, held on January 14 at St. Paul, Minn. The meeting was called to order by President H. W. Maurer, truck-shop foreman, Soo Line, and a written discussion of rule changes, prepared jointly by Vice-President C. E. Barrett, district general car foreman of the Milwaukee, and Secretary-Treasurer E. N. Myers, chief interchange inspector, Minnesota Transfer, was read by G. H. Wells, assistant to superintendent car department, Northern Pacific.

Railroads represented at the meeting, besides the four already mentioned, included the C. B. & Q., C. G. W., C. R. I. & P., C. St. P. M. & O., Great Northern and M. & St. L. A total of about 70 railroad carmen were in attendance and those who participated in the discussion included car-department officers, supervisors and inspectors.

Following the summary of the changes in the rules presented by Mr. Wells, the discussion brought out some differences of opinion as to the significance of some of these changes. A transcript of the discussion follows:

A. McArthur (*N. P.*).—I have seen some welded reservoirs on passenger train cars and am wondering if the rule prohibiting the welding of auxiliary reservoirs pertains to passenger cars.

H. W. Maurer (*Soo*).—I would say that would apply to passenger cars, the same as to freight cars. However, the only cases of iron reservoirs you find are on the AB brakes on some of the troop cars.

Mr. McArthur.—Is it premissible to weld or braze steel reservoirs?

Mr. Maurer.—I would say so.

G. A. Webster (*N. P.*).—One change in Passenger Car Rule 7 clarifies a question which no one seems to agree on; that is, the cleaning of air brakes on troop-kitchen and troop-sleeping cars with AB brakes, two brakes on one car. Under the 1945 rules, it was not clear and no two persons seemed to understand it the same. Now it is compulsory to clean both brakes, the same as on freight cars.

J. L. Tebo (*Soo*).—I would like to get some information on the change in the second paragraph of Rule 94. I am not quite clear as to the meaning. On Page 180, down near the bottom of the page—"and owner elects to retire instead of repair car, charge may be made for material and labor as would have been required for repairing or renewing items actually listed on the defect card, excluding labor and material for undamaged associated parts—." Just for example, suppose a defect card covers repairs to the underframe or draft sills of a refrigerator car with steel underframe. Is the owner, making bill on defect card, permitted to charge for R & R of steel underframe in order to get at draft sill?

C. E. Barrett (*Milwaukee*).—Unless Rule 107 included associated part, it would not be allowed under the rule. If Rule 107 does not list it as associated part, it would not be.

Mr. Maurer.—The last part of that paragraph covers it. You cannot charge for R & R.

E. N. Myers (*C. I. & L.*).—It seems to be clear enough. It appears to me to be full defined in that last paragraph.

Mr. Tebo.—It says "except where the allowance in Rule 107 includes labor for R & R of such associated parts," so if Rule 107 includes labor, you could charge.

Mr. Myers.—If price includes R & R then leave it in, but you could not charge for anything except R & R. Does that clear it up, Mr. Tebo?

Mr. Tebo.—Yes, I wanted to get the opinion of some others. That is my opinion.

H. R. Longhurst (*Soo*).—If there are no more questions on the changes in rules, I would like to bring up a question regarding Rule 66—method of packing boxes. I would like to know from some of the men here whether they are experiencing any trouble due to the packing rolling out from under the journal, due to lack of a front wad in packing boxes. New rules give you alternate methods of either putting all packing back of the collar, straight down, starting from one inch below the center line of journal, or inclined toward the front of the box. It has been my experience in this cold weather, with that small amount of packing in the box and no front wad packing, that it rolls out completely from under the journal. We are suggesting putting in the front wad to help retain some packing under the journal. I would like to know what experience some of the other roads have had in this respect.

R. J. Stephens (*G. N.*).—I have had a little experience along that line, having been an oiler and brasser for about two years at Grand Forks, and two years in yards and am now car inspector at St. Cloud, Minn. It has been my experience that if the front wad is not in there you have a lot less trouble if the box is packed so you have it sloping down from the edge of the collar to the front of the box. That has been my experience for a matter of four years.

Mr. Longhurst.—I would like to clarify my question. It runs fine in the summer time, but how about sub-zero weather trouble?

Mr. Stephens.—A lighter oil works better, if you do not put too much in. Running on the road you are going to lose a lot more dope out of boxes packed with wads and you create that much more pressure against box covers, causing them to open and permit packing to roll out, and you have that much more trouble.

Mr. Longhurst.—We find any number with good tight box covers with all of the packing between the collar and the box cover when you open the box cover. We also find some boxes that have more packing. With the front wad, packing may have rolled some, but it does not roll nearly as much as in a box with a small amount of packing.

Mr. Stephens.—I maintain as long as the dope is packed solid back along the journal you have enough in the box. Having enough oil is the main trouble with all journal packing. Ninety per cent do not have enough oil in the packing to keep it from rolling.

Mr. Longhurst.—In Chicago last week at a meeting there were several representatives from the Chicago Interchange Bureau and they all agreed the main cause of packing rolling is excessive oil. I would like to get the opinions of some of the men in the yards. You can have too much oil and if you do have too much oil, the packing will roll.

Mr. Stephens.—Too much oil is no good, but plenty of light oil is what we need in this climate. We are running cars on our northern roads that are equipped to run in the south, mostly refrigerator cars. That is where you have the biggest part of your trouble, with refrigerator cars. They are not taken care of properly. We have to have light oil. Heavy oil will not meet the conditions of this climate.

E. J. Davis (*G. N.*).—I was just wondering if in this northern country we would not be better off to use rolls instead of mass packing. I think we would have less trouble if we used all rolls instead of mass packing. I do not believe that front plug does any good. I have not seen them stay in in cold weather.

W. D. Wiler (*C. G. W.*).—At one time we had a president of this association who was a great advocate of free oil and at many meetings the subject of free oil would come up. Many of us laughed at him at the time, and did not consider free oil really necessary, but during the war many of the roads put on oilers and by giving the boxes a little oil on the starting side of the journals after trains were made up before departure a great deal of hot box trouble was eliminated. So far as free oil is concerned, I do not believe there is a car inspector in St. Paul or Minneapolis who does not use a little free oil and cut it in cold weather on passenger equipment, and I know on our line we do not experience the hot-box trouble on passenger equipment such as that which we experience on freight equipment.

Mr. Stephens.—That goes to prove our contention that a good light oil will take care of that because light oil will not harden in cold weather.

Mr. Longhurst.—I am talking about A.A.R. all-season oil. We are dealing with cars from down south. We have to run them and cannot pack them all.

Mr. Stephens.—One thing I would say about packing boxes light. If you have to get out and spoon it down it is all right, but if it is packed in tight with a full front wad, no one is going to spoon it down in zero weather. The whole secret is putting it in tight enough in the first place; then you will not have difficulty with a little bit of packing down and light oil enough to keep it from rolling. If the packing is applied to the box right it will not roll out of place.

Mr. Longhurst.—The Canadian Pacific really run where it is cold and you do not find them putting out any cars packed without a front wad and a full inch below center line. I will say this, the Canadian Pacific cars run well in cold weather. I will add that they cut back their oil with a blending oil.

George Schadegg (*C. G. W.*).—I have mentioned here at meetings several times that I think the solution to the hot-box trouble is wool dope—that is, a light oil and wool dope.

Mr. Wiler.—I might add to that. With the packing retainers being used on freight cars and new cars being built, some of which are equipped with the packing retainers, you cannot use the front plug because there is no room for it and the plug is not necessary, as the retainer tends to keep the packing from working out. Last summer or late fall a gentleman from the A.A.R. was invited to go over our line and help us solve some of the hot-box trouble we had been having. He did not seem much concerned as to whether or not the front plug was being used, but he believed that if the packing was in place and kept one inch below the center line of the journal and kept even we would be doing our part in trying to prevent hot boxes if the brasses, wedges, etc., were in good condition. Of course, this was before freezing weather and we did not have the boxes in the condition such as they are during winter weather. We have applied the packing retainers to our trailer flat cars that operate between St. Paul and Chicago. These cars get little switching, and boxes are serviced at both ends of the line. For your information, we have had little hot box trouble on these cars, which evidently is due partly to little switching. Possibly these cars get a little better servicing and attention than other cars, in addition to little switching and that accounts for such few hot boxes.

We know that with regular freight equipment during the winter months, after cars lay over awaiting trains, when switched into trains the packing is rolled so badly that it forces the oil-box lids open and it is a difficult job to get it back in place. This has been our problem for many years during winter months in this territory.

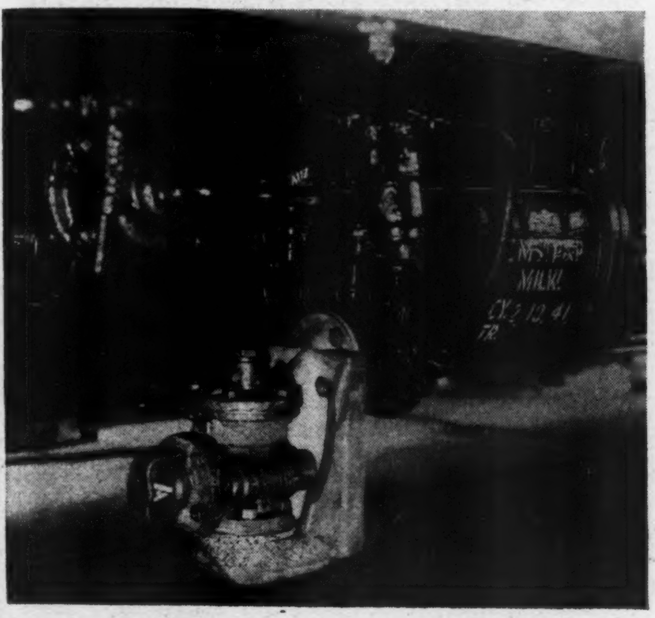
N. T. Haugen (*N. P.*).—I am interested in the packing of boxes as much as the rest of the fellows and wonder if they have found in their experience, since they started putting less packing in boxes, quite a number of cases where they were cutting down just a little too much. In a great many cases you will find, if you examine journals, very little bearing on the dope. In other words, I am not advocating putting in as much dope as we used to and yet we must put in enough to come up to one inch below the center line of journal. With the front plug missing, you will find that condition is more pronounced if you start putting in a packing retainer. Quite a number of cars with packing retainers and a small amount of dope are actually causing some of our hot boxes today. I have not been much in favor of packing retainers. I think in a good many cases they are not putting in enough dope. This rolling of dope has always been a headache. Refrigerator cars operating out of California seem to give more trouble than do our own. I am not prepared to give the answer, but I think oil that is not quite as adhesive and sticky at this time of the year would help.

Angle Bracket For L-3 Triple Valve

*By Tom Birch**

The L-3 passenger triple valve normally applied to the car with the main piston and slide valve in a horizontal position is, at the best, erratic in operation due to the excessive friction caused by the combined weight of the piston, slide and graduating valves, this combined weight being 5 lb.

This type of triple valve cannot remain in service for any great length of time without mechanical attention due



Special angle bracket used in transferring L-3 triple valve to vertical-operating position

to the weight of the piston quickly wearing away the lower part of the main cylinder bushing, causing the triple valve parts to fail to move to release position under certain operating conditions. Consequently, this frequent handling of the valve tends to cause a high maintenance cost in addition to the poor operation afforded.

But there is a way whereby the weight of the piston and slide valve can be made an asset instead of the liability that it now is. This is accomplished by installing the L-3 triple valve so that the main piston and slide valve will travel in a vertical position instead of the present horizontal. This not only reduces the friction and brings about a uniform wear of the main cylinder bushing, but makes for almost positive release under any operating condition on account of the small differential required to move the main piston and slide valve to release position.

One of these triple valves has been applied in a vertical position to a Milwaukee passenger car since June, 1940, a period of 5½ years. During this period we have expended $8.95 for the maintenance of the valve, whereas the same valve applied in the present accepted position (horizontal) would have required an expenditure of $54.00 to maintain it in proper operating condition. So, by applying the valve in a vertical position, we have reduced the maintenance cost about 83.5 per cent.

This saving is in addition to other monetary savings obtained through the elimination of slid-flat wheels, train delays, etc., which are due to the erratic action of the valve when in a horizontal position. During this 5½-year period no wheels have been slid flat.

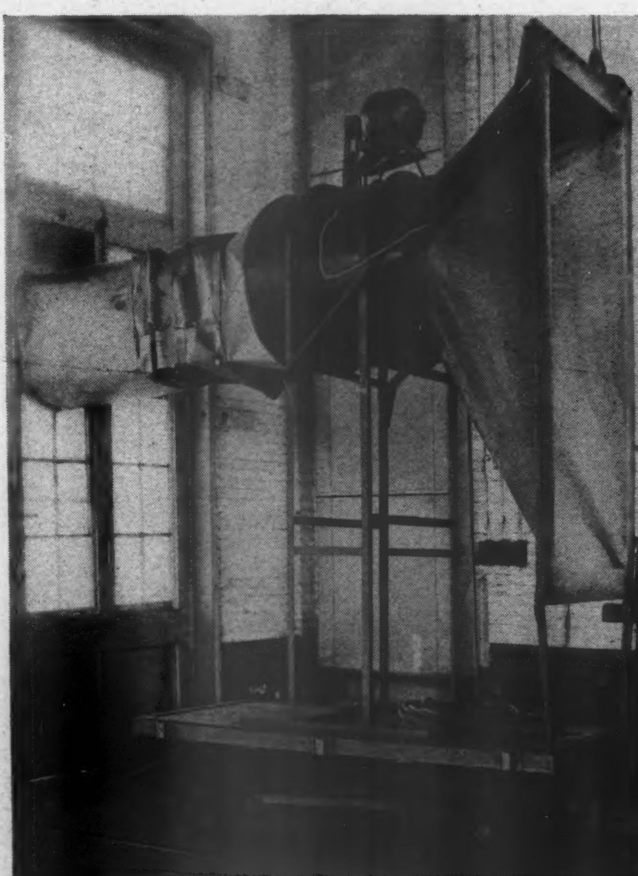
The special bracket required for changing the L-3 triple valve from a horizontal to a vertical operating position is shown in the illustration. No changes in the piping arrangement are necessary when using the bracket, which is simply applied to the present bolting face on the cylinder pressure head and the valve is bolted to the bracket.

* Air room foreman, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.

Portable Exhaust Unit

A portable unit for removing paint fumes from passenger cars, the interiors which are being spray painted at the Aurora, Ill., shops of the Chicago, Burlington & Quincy, is shown in the illustration. It consists of a portable four-wheel trailer with a 42-in. by 84-in. platform on which is mounted at the center a 1½-in. welded angle-section framework which supports a 3-ft. horizontal exhaust pipe and blower unit with an expanded canvas connection to a diaphragm face plate at the right. This face plate, which covers the opening in the end of a vestibule-type car, is supported at the proper elevation by two angle extensions to the trailer platform corners and is kept vertical by two diagonal braces at the top.

The blower unit consists of a DeVilbis six-blade fan with V-belt drive from a G. E. 2-hp. electric motor on top of the unit. The insulated electric cable, used in making connection with the nearest wall outlet, is shown coiled up on the truck platform. From the left or outlet side of the blower unit, a paper-covered telescoping frame extends to a window opening in the shop door at a level approximately 7½ ft. above the shop floor. This telescoping feature is required to accommodate slight differences in car-end position with respect to the shop door. The center line of the exhaust fan and air duct is offset



Portable exhaust unit used in the Aurora passenger car paint shop of the C. B. & Q.

approximately 18 in. above the center line of the diaphragm in order to deliver air outside the shop door at an elevation above the heads of persons passing outside.

In operation, therefore, this blower unit is inserted between a vestibule-type passenger car and the window opening in the paint-shop door. All vestibule doors and windows in the car are closed. Operation of the blower fan will then cause a strong induced flow of air through the entire length of the car and effectively exhaust this air and any accompanying paint fumes to the outside of the shop. As a result, atmospheric conditions inside the car will be improved for the painters working there.

Air Brake Questions and Answers

HSC Equipment on Passenger Cars and Diesel A and B Locomotive Units Brake Application

Operation of the Automotive Brake Valve

366—*Q.—How many positions has the brake valve handle?* A.—The brake valve handle has five positions notched on an internal quadrant.

367—*Q.—What are these positions?* A.—(1) Release and running; (2) first service; (3) lap; (4) service, and (5) emergency.

368—*Q.—Describe release and running position.* A.—In this position the brake system is charged as described previously under Charging the Equipment, the action being the same as when operating the HSC brake system.

369—*Q.—Is the handle left in this position when running?* A.—Yes.

370—*Q.—How are the reduction limiting reservoir and equalizing reservoir connected up in this position?* A.—The reduction limiting reservoir is open to the brake valve exhaust, and the equalizing reservoir is charged to brake pipe pressure.

371—*Q.—What is the first service position used for?* A.—This brake valve handle position is used to make a specified amount of brake pipe reduction as the first part of a "split" reduction when making a stop from high speed, thus adjusting train slack gently.

372—*Q.—What position is used after this?* A.—Service position is used to complete the desired total reduction.

373—*Q.—What ports are opened as the brake valve handle is moved to first service position?* A.—Rotary valve *54* blanks port *a*, thus cutting off supply of feed valve air to port *2* and the brake pipe. Ports *4* and *24* are connected through a choke in the rotary valve so that air from the equalizing reservoir and chamber *D* of the equalizing piston valve flows through passages *5* and *5a* of the M-2 brake application valve, thence through cavity *t* in slide valve *6*, port, passage and pipe *4* to connection *4* of the MS-40 brake valve, thence through the choked port to port and pipe *24* to reduction limiting reservoir.

374—*Q.—How does this affect the equalizing reservoir?* A.—This results in an initial equalizing reservoir reduction of approximately 6 lb. at the standard service application rate with 70 lb. brake pipe pressure, or 8 lb. with 110 lb. brake pipe pressure.

375—*Q.—How is the reduction limiting reservoir connected up?* A.—The reduction limiting reservoir is connected to connection *24* of the M-2 brake application valve, thence to slide valve *6*, choke *N*, cavity *Z* and port *C* to exhaust EX, so that the initial reduction at the standard rate into the reduction limiting reservoir is followed by a slower rate of reduction at the *M* brake application valve exhaust.

376—*Q.—What is the effect of these reductions?* A.—In this manner the equalizing reservoir pressure is reduced quickly by an amount sufficient to initiate quick service through the train, after which the reduction continues at a slow rate.

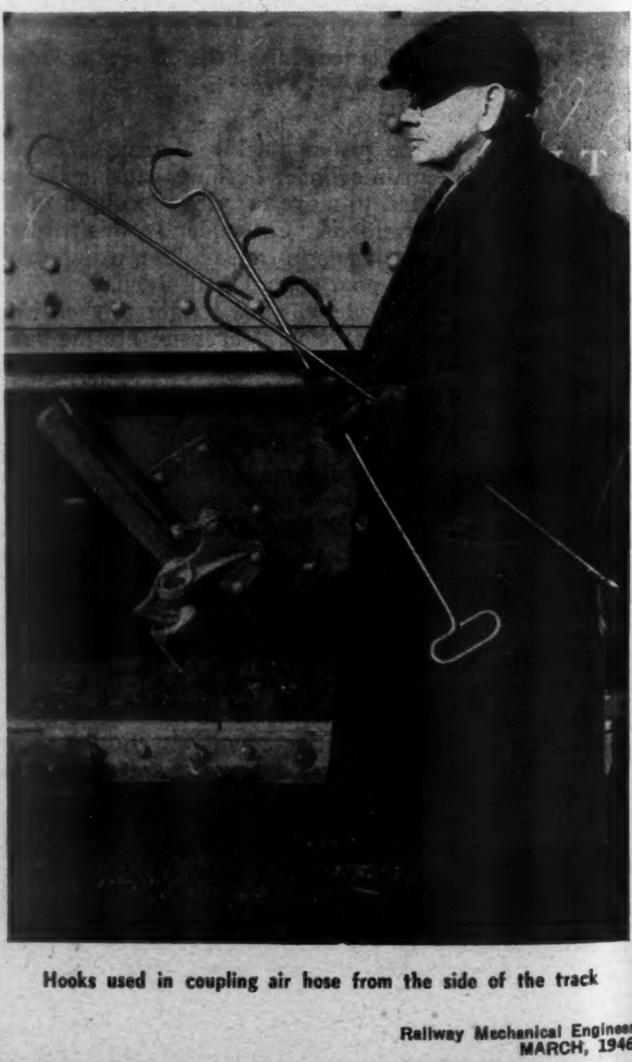
377—*Q.—What determines the rate of the slow reduction?* A.—This is predetermined by the size of the M-2 brake application exhaust choke *N*.

378—*Q.—What functions to unseat the discharge valve and reduce brake pipe pressure?* A.—As chamber *D* of the equalizing piston is connected to the equalizing reservoir, an equal reduction results in this chamber. As pressure is thus reduced on the face of equalizing piston *42*, the higher brake pipe pressure in chamber *F* on its opposite side moves the piston to the left, which in turn moves the long end of lever *49* so that the short end of the lever unseats the discharge valve *44*.

379—*Q.—In first service and service positions of the MS-40 brake valve handle, how is the brake pipe exhaust connected to the atmosphere?* A.—The brake valve rotary *54* connects the brake pipe exhaust port *16* of the equalizing discharge valve passage *16* to the brake valve exhaust, Ex. Brake pipe air is reduced by flowing past the unseated discharge valve *44* in the equalizing piston valve to pipe *16*, valve port *16* and the valve exhaust.

Air Hose Coupling Hooks

In few, if any, railway train yards of the country is more effective use being made of air-hose coupling hooks than at Chicago Junction and Chicago River & Western Indiana tracks in the Union Stock Yards, Chicago. For a num-



Hooks used in coupling air hose from the side of the track

ber of years, the local General Managers' Association has required that the air hose on all trains departing from these yards be coupled by carmen employed by the Chicago Car Interchange Bureau and, when this practice was first instituted, the problem of safety seemed critical because the large number of cars handled, about 35,000 cars a month, precluded supplying blue-flag or switch-lock protection for the men actually engaged in coupling air hose.

This problem was solved by adopting and perfecting a method, employed to a limited extent in other railroad yards, of using two long-handle steel hooks of special design which permit carmen to couple air hose without stepping between the cars. Considerable experimentation and persuasion were required to get these hooks properly designed and generally used, but eventually the carmen found that hose could be coupled both safer and easier by using the hooks, which then became popular. Since adoption of the hooks, there has been no instance of a personal injury while coupling air hose at the Union Stock Yards.

Not only is safety assured by use of hose coupling hooks, but the work is done easier and faster, since carmen can remain in practically an upright position while making a hose coupling, which normally takes not over five seconds, and then pass on to the next car. With hand coupling carmen have to step between the cars, stoop down, reach under the car couplers, couple the air hose and then back out from between the cars, which requires more physical effort and takes longer. It is reported that, in a test of two 75-car trains on adjoining tracks, arrangements were made for two carmen to start coupling air hose simultaneously, one man using the hand-coupling method on one train and the other using hose coupling hooks on the adjoining train. The carman with the hooks finished his job first, in about 30 minutes, at which time the other carman still had a total of 20 cars to couple.

The illustration shows the design and method of using hose coupling hooks at the Union Stock Yards. The hooks are made of spring steel 3/8 in. by 48 in. and 1/2 in. by 40 in., each provided with a handle at one end and a hook at the other to engage the air hose. The longer hook is used in the left hand to extend under the car coupler and reach the further air hose coupling which is pulled to the coupler center line. The shorter hook in the right hand engages the nearer hose and, with a quick twist of the wrist, this hose is kinked, the two hose couplinsgs brought together and, with release of the hooks, the coupling snaps in place.

Some carmen deem it advantageous to make slight alterations in the length and form of the coupling hooks best to suit individual ideas. In general, the handles are made only as long as necessary to reach the air hose without stepping between cars. The longer hook is used only for a straight pull on the left hose, hence it can be made of lighter wire, in this instance 3/8 in. The shorter hook needs to be a little stiffer, since it is used to kink the right hose which may be relatively stiff, especially in the winter. In this instance, the shorter hook is made of 1/2-in. steel and the hook end is twisted as shown in the illustration to permit kinking the hose just right for the coupling.

Applying the hooks to the hose

Completing the coupling

IN THE BACK SHOP AND ENGINEHOUSE

Lubrication of Pneumatic Hammers

Pneumatic hammers must be removed from service and repaired frequently because their internal parts do not receive good routine lubrication and cleaning while being used in backshops or enginehouse. To service these hammers the Baltimore & Ohio recently installed a combination cleaner and oiler in its Riverside, Md., enginehouse and is planning to make similar installations in most of its shops and terminal facilities.

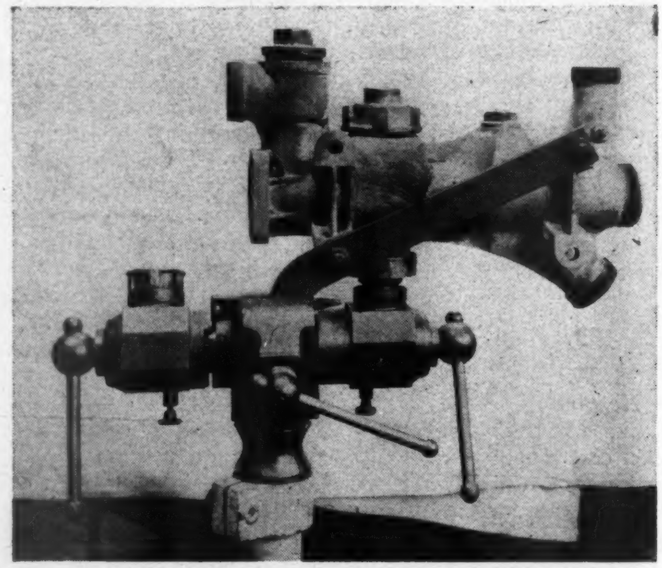
As shown in the illustration, the cleaner and oiler has two glass syphon bowls connected to the shop compressed-air line through a three-way valve. In operation an air hammer is connected to the right-hand side and carbon oil is syphoned from the bowl and blown through the hammer by compressed air. After the tool is blown out with the carbon oil it is connected to the left-hand side and is blown out with machine oil from the syphon bowl

Combination air-hammer cleaner and oiler

on that side which lubricates the internal parts of the hammer. This equipment has eliminated many repairs to air hammers and has permitted them to be returned imediately to service.

Steam Injector Repair Stand

The exhaust-steam-injector repair stand, shown in the illustration, has given excellent service at the Grand Rapids, Mich., shop of the Pere Marquette and may also be used in repairing locomotive whistles. It consists of a 4-in. steel tube rigidly set in a 22-in. base plate and carrying at the top a special vise and double injector support stand. A 3-in. horizontal steel bar is built into



An injector repair stand used at the Pere Marquette shops, Grand Rapids, Mich.

the vise and threaded on each end to carry a revolving injector post capable of being held in any one of four angular positions by means of the locking keyways and outer vise handles, illustrated. The entire stand may be revolved in a horizontal plane and clamped in any desired position to suit the convenience of the repairman. The diagonal brace, separately-supported in the center vise jaws, is used to stiffen the injector while nuts are being removed. Adapters are used for various sizes of injectors, or whistles.

Locomotive Boiler Questions and Answers

By George M. Davies

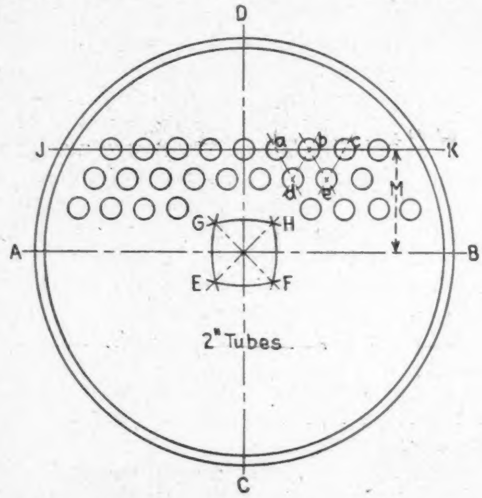
(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Laying Out Tube-Sheet Holes

Q.—Please explain method of laying out the tube sheets of a locomotive boiler, where the tube holes are staggered?

A.—The accompanying illustration shows the method of laying out the tube holes in the front and rear tube sheets of a locomotive boiler, where the tubes are staggered. For a front tube sheet it is first necessary to locate the center of the tube sheet. Divide the outside circumference into four equal spaces and locate points *A*, *B*, *C* and *D*. Then with the trams set with a radius slightly larger than the radius of the tube sheet and with

the points A, B, C and D as centers, scribe arcs intersecting at the points E, F, G and H as shown. Connecting the points FG and EH locates the center O. Next, draw the horizontal and vertical center lines of the tube sheet at right angles to each other. Then lay off the top row of tube holes the correct distance M from the horizontal center line, JK being parallel to AB. Space off on this line the required number of tubes on each side of the vertical center line, the spacing to be 2¾ in. for a 2-in. tube with a ¾-in. bridge or space between the tube holes. To locate the tubes in a staggered position proceed as follows: With points a, b, c on the line JK as centers and with the dividers set equal to the tube diameter plus the bridge, 2¾ in., scribe arcs intersecting at d and e. It will be noted that the points d and e stagger or lie between the distances, ab and bc, respectively. This procedure should be continued until the required centers for the tubes have all been laid out. The firebox tube sheet must be centered to correspond with the centers of the front tube sheet. The center lines are then drawn and the required centers laid off about them, in the same manner as for the front tube sheet.



Method of laying out staggered tube-sheet holes

Keeping Arch Tubes Tight

Q.—We are having considerable trouble keeping arch tubes tight in the sheets. We have been advised to build up around the arch-tube hole with electric weld to provide additional holding surface for the tube. Is this permissible?—F.I.D.

A.—It is permissible to build up around the arch-tube holes with an electric weld to provide additional holding surface for the tubes. This is done best on new sheets prior to drilling for the arch tubes. However, with reasonable care it could be done on an existing installation by removing the arch tubes, welding a pass of desired thickness around the hole, and reaming out the welded hole to the proper size for the arch tube.

Smokebox Life

Q.—What is generally considered the life of the smokebox of a modern high-pressure steam locomotive? Does increasing the thickness of the smokebox sheets lengthen the life of the smokebox?—M.J.K.

A.—The average life of a smokebox varies from 12 to 20 years, after which renewals are necessary because of pitting and corrosion caused by chemicals of a sulphuric acid nature formed from the sulphur in cinders and the water of condensation from leaks in the front end. Cinder cutting due to high velocity of the gases also affects smokebox life. The chemical action can be overcome to a great extent by eliminating leaks in smokeboxes and the regular removal of cinders. For many years smokeboxes were made of ½-in. plate with ⅝-in. and ¾-in. liners for the cylinder saddle. As the size of locomotives increased the thickness of the cylinder saddle liners were increased to ¾ in. and extended up to the center line of the boiler; thus, substantially reinforcing the smokebox at the cylinder saddles. Some roads have increased the thickness of the smokebox to ¾-in. with ¾-in. and heavier smokebox liners on large smokeboxes with cut-outs on the top for multiple throttles and heaters.

Flame Gouging

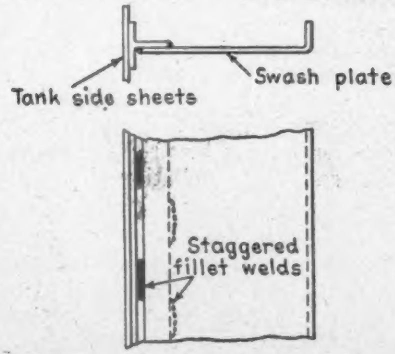
Q.—What is flame gouging? Where is it used in boiler work?—R.C.D.

A.—Oxyacetylene flame gouging was developed to produce in a more efficient manner the same results as a mechanical gouge made by machining or chipping. Some of its uses in boiler work are the making of J- or V-grooves for welding, the preparation of the undersides of welds for a back-up weld pass, the removal of unwanted weld metal, and for removing tack-welds or other temporary weld metal. Flame gouging is accomplished by means of a special nozzle that produces a relatively large oxygen flow at low velocity. In the same way as in flame severing, oxyacetylene preheating flame, supplied through the same nozzle, heat a spot at the edge of the material to be removed until it is red hot. Then, the cutting oxygen valve is opened and the cutting action starts. The contour produced during gouging depends upon such factors as speed of passage of the flame-gouging equipment, oxygen pressure, nozzle size and angle of incidence of the oxygen stream. While preparing plate edges for J- or V-grooves by the flame gouging method can in some instances be satisfactorily done with hand-operated equipment, a mechanical set-up is preferable.

Welding Swash Plates

Q.—In welding tank swash plates which are to be secured at the top, bottom and outside edge, should the weld be continuous? —F. I. D.

A.—The welds to the vertical tee iron should be staggered as shown in the accompanying illustration, and should be at intervals to produce a strength equal to that of riveted construction. The general practice is to make 2-in. welds at approximately an 8-in. pitch. While the welds for fastening the swash plates at the top and bottom may also be staggered, the general practice is to have non-staggered intermittent welds, especially where the plates at the bottom are welded directly to a cast-steel tender bed. These welds must be approximately 30 per cent stronger than the welds along the sides of the swash plate.



Welding swash plates to tank side sheets

Baltimore & Ohio

Streamlines Its Shops

Competition in transportation is responsible for all-out efforts by the railroads to increase the speed and comfort of passenger service and to obtain higher speed and greater capacity in freight haulage. These efforts have resulted in the streamlining of motive power and rolling stock and the increased use of lightweight metals in construction which, in railroad transportation, enables the haulage of maximum revenue tonnage with a minimum weight of equipment. In addition to the above elements, the proper color scheme for painting is required in order to present a pleasing appearance to the eye, particularly in the passenger service, where both the exterior and interior of trains are in constant view of the comfort-conscious customer. Streamlining and color have uses other than in the construction of motive power and rolling stock alone. Applied to shop operations streamlining means not only speeding up and increased efficiency, but also the elimination of unnecessary parts, the replacement of old methods by better ones, and a general improvement in all phases of shop work. Color has an important relation to eye fatigue, eye strain, and safety in the shop.

Most railroad men are familiar with the machine shops having belt-driven machinery that requires a maze of overhead line shafts, pulleys, bearings and belt shifters suspended from the roofs of buildings and requiring substantial building supports to carry this load. Shop illumination was anything but satisfactory and difficulties were encountered in the accurate machining of parts with this lighting. These outmoded machine shops on the Baltimore and Ohio are gradually taking on a new appearance as a result of the extensive machinery replacement programs this railroad has undertaken in order to streamline its machine shops so that motive power and rolling stock of new design may be maintained efficiently.

Repairs of high quality to this equipment requires the use of new machine tools and the rebuilding of the older machine equipment to give it more capacity, better control and greater accuracy because of the increased size of locomotive and car parts and the closer tolerances used in machining those parts. The new machines installed are equipped with direct electric-motor drives, push-button controls, and selective speeds and feeds. Old machines are being modernized either by the application of direct motor drive through geared heads where possible or by the application of individual motor drive by means of belts, the latter having electric starters and electric control mechanism. The installation of the new machines and the changes in the old machines, together with improved jib-crane facilities at each machine, have gradually eliminated the overhead line shafting and appurtenances. These changes allow many improvements to be made in the layout of the individual shops which results in a betterment in appearance, cleanliness, ventilation, arrangement of machinery, efficiency of operations and handling of materials. Increased production and safety is the result.

However, with all the improvements heretofore mentioned there was one thing still lacking before the machine shop could be considered completely up-to-date and that was the selection of a pleasing and functional color scheme for the machinery, appliances and surroundings. Throughout World War II a number of paint manufacturers conducted extensive research work with the object of improving vision in industrial establishments by using the correct combination of color and light. This research was concerned not only with the background of factory walls, floor and ceiling but also with the machine tools. It was found that machine tools painted entirely in dull colors actually absorb necessary light in addition to causing shadows and merger of light into a color similar to the parts being machined, thereby causing eye strain or fatigue. Methods of painting machinery were developed involving two basic factors—brightness and contrast, which reduces not only eye strain or fatigue but also personal injuries.

These effects were accomplished first by using a focal color on the critical or working parts of the machines which was in sharp contrast to the non-critical parts of the machines and also to the material being machined or fabricated. Next, the body of the machine or non-critical parts were studied to find a contrasting color that would separate them from the working area. Safety hazards were then considered and definite colors selected that would not only attract the workers' attention but would bring immediately to his mind, the specific thought of danger. These safety-hazard colors would apply to overhead moving equipment and to motorized trucks operating in the aisles. The aisles were to be definitely outlined so that the machine operators would be reminded of the thoroughfare and have less tendency to "jay walk" in front of moving trucks. The colors selected for the background of the factory (the walls) were those which would be restful to the eyes, and those colors were selected for the ceiling which were capable of a maximum reflection of light.

After careful study of this research work which had been made available by the paint manufacturers, the B. & O. chose its Cumberland, Md., enginehouse machine shop as its experimental shop for the development of the color scheme. The following colors of special mixed paint were selected:

Object or Part	Color
Critical or working parts of machines	Spotlight buff
Machine bases and non-critical parts	Horizon gray
Traffic lanes and jib cranes	High visibility yellow and traffic black
Motorized trucks	Alert orange
Fire protection appliances	Fire protection red
Upper walls	Bright green
Lower walls	Spotlight green
Border between upper and lower walls	Dark green
Ceiling	White

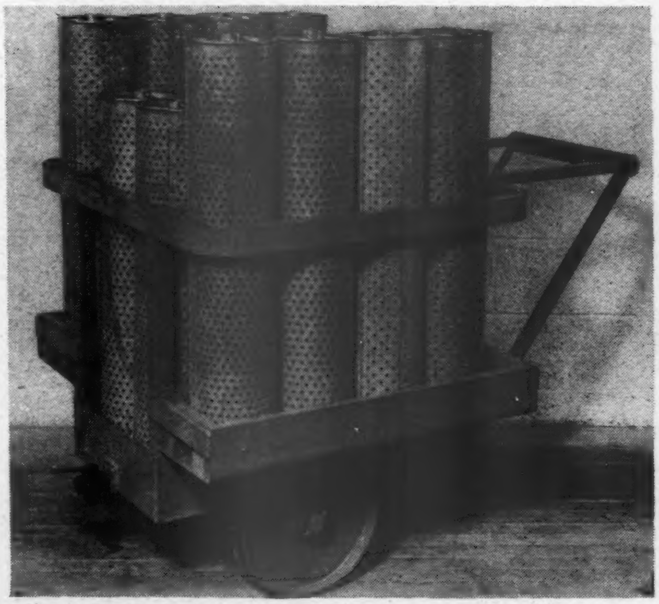
Hence, the installation of new machines, together with the improvement of existing machines which had already greatly lightened the manual effort of operation, has now been supplemented by a method of painting which relieves eye strain and fatigue and increases safety. The modernizing of the Cumberland shop had a psychological effect on the workmen. Pride is being taken by the operators in keeping machines well lubricated, in the cleanliness of their surroundings, and in maintaining minor repairs. It has stimulated initiative for the development of improved methods. Tools of higher cutting specifications have been introduced with the motorization of the machines and the combination has resulted in heavier cutting, definite accuracy in the work and noticeable improvement in quantity and quality in production.

A color scheme to relieve eye strain and promote safety at the Cumberland, Md., enginehouse machine shop of the Baltimore & Ohio—Streamlining of the shop included the installation of new machine tools, the application of individual motor drives to existing machinery and a rearrangement of the equipment

Cleaning Diesel Engine Filters

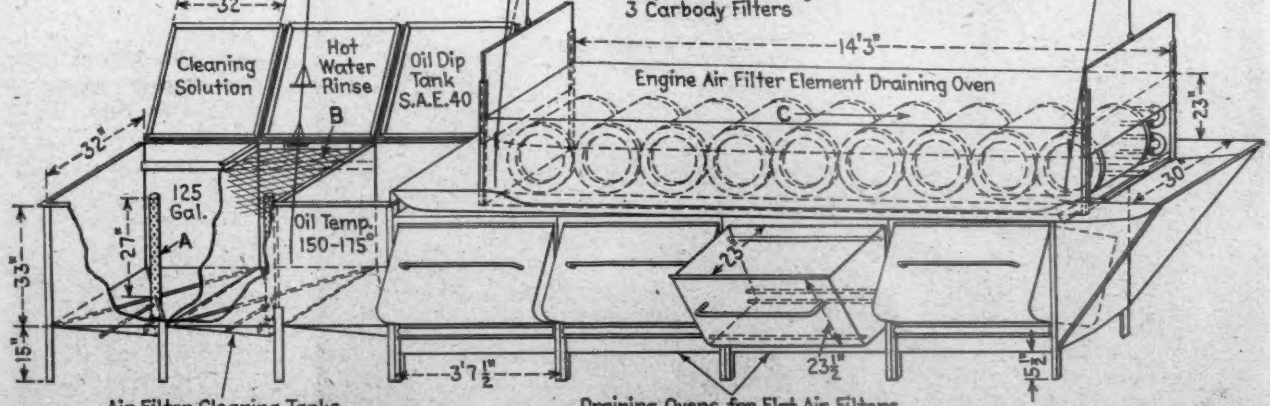
One of the important requirements in connection with Diesel locomotive servicing and repair shops is adequate equipment for cleaning both air and oil filters which, when ineffective, cannot be used for long without the development of serious engine trouble. Intake air for the Diesel engines must be practically free from dust or abrasive particles which would tend to cause cutting or excessive wear of packing rings and cylinder liners. The same result, plus rapid wear of all bearings and bearing surfaces, will occur unless the engine oil is thoroughly filtered each time it passes through the oil lubrication system. Another, perhaps less vital but still important, requirement is the filtering of air before it passes into the engine-room of the locomotive.

Special welded-steel table and waste container used in cleaning lubricating-oil filters



Two-wheel cart used in handling lubricating-oil filters

Filters of all three types mentioned, used on Electro-Motive Diesel locomotives, are cleaned periodically by means of special equipment shown in the drawing and half-tone illustrations. Before setting up facilities of this kind, it is essential to determine how many filters must be cleaned daily, and this can be calculated as follows: (1) Ascertain the types of locomotives (passenger, freight or switcher) and number of units to be maintained at the maintenance point under consideration; (2) ascertain the average mileage a month each locomotive will cover; (3) determine the average number of miles a day locomotives will operate by dividing Item 2 by 30 (days per month); (4) determine the frequency of engine air filter changes (2,000 miles) by dividing 2,000 by Item 3; (5) determine the average number of



General arrangement of special equipment used for the cleaning of Diesel-engine air filters

Cleaned engine air filter ready for immersion in the oil dip tank

units to be serviced per day (24 hours) by dividing Item 1 (total number of units) by Item 4; (6) determine the number of engine air filters required each 24 hours by multiplying Item 5 by the number of filters per unit; (7) determine the number of engine-room air filters required by multiplying Item 5 by the number of filters per unit and dividing the result by 3. (Note: Engine-room air filters are changed at intervals of 6,000 miles.

Example:—A railroad operates sixteen 5,400-hp. freight locomotives (64 units) an average of 12,500 miles a month. Dividing 12,500 miles by 30 (number of days per month) gives 408 miles a day average. Dividing 2,000 miles (inspection period) by 408 gives approximately a five-day maintenance routine. Again dividing 64 units by 5 makes approximately 13 units a day for maintenance. The requirements therefore equal 13 times 2 (number of filters per unit), or 26 engine air filters each 24 hours. Multiplying 13 by 18 (the number of filters per unit) and dividing by 3 (6,000 mile inspection period) gives 78 engine-room air filters each 24 hours. Using these figures, reference to the size and capacity chart will give the size of ovens required in the filter cleaning equipment.

Engine air filters are recommended for cleaning after 2,000 miles in freight service and 2,500 miles in passenger

Oven Size and Capacity Chart

Number of bins for engine-room filters	Capacity per 8-hour shift	Length of oven, in.	Oven for engine air filters, capacity per 8-hr. shift	
			Freight	Pass. and switch
2	18	80	4	6
4	36	160	8	12
5	45	206	10	15
6	54	252	13	19
7	63	298	15	22

service and weekly in switching service. Engine-room air filters are cleaned after 6,000 miles in freight service and 10,000 miles in passenger service. Using the mileages permissible in all three services, it is possible to compute the total air filter cleaning capacity required at any given point and build equipment to meet this need. Obviously, also, some consideration must be given to increased future requirements.

Referring to the drawing, the layout of a typical air-filter cleaning plant will be apparent. It consists of (from left to right) three adjacent tanks for cleaning, rinsing and oil-dipping respectively, served by an overhead monorail with traveling lift blocks and light aircraft cable used to lift the cylindrical engine filters in and out of the

Diesel parts cleaning room—Filter-cleaning equipment on the right

tanks by means of special lifting tongs or a lifting plate and a three-way adapter in the case of the flat engine-room air filters. The total tank capacity is 125 gal.

Next to the cleaning tanks is located the welded-steel structure which contains pull-out draining ovens for flat air filters in the base and a long flat oven on the top, sloped approximately 2 in. in 10 in. to allow the cylindrical filters to roll forward and also drain off excess oil as they pass through the oven. A sliding vertical sheet-metal door at either end closes the oven, in which a temperature of 200 deg. to 250 deg. F. is maintained by means of suitable steam coils. This oven is 23 in. high by 30 in. wide and long enough, as designed in this instance, to accommodate nine cylindrical filters. The oil which drains off the filters is piped back into the oil-dip tank. Each of the four pull-out ovens underneath the flat oven is approximately 23 in. square by 3 ft. 10 in. long and has a capacity for nine filters. It may be easily pulled out for insertion and removal of the filters.

In cleaning cylindrical air filters, a lifting plate is applied as shown in the drawing, which closes the end of the filter and has a hook at the top for attachment to the lifting device. The filter is placed over the live steam agitating pipe *A* in the first tank section which is filled with a hot alkali solution. Steam from the agitator pipe circulates the cleaning solution rapidly through the filter in the reverse direction from the usual air flow and quickly dislodges all dust and dirt. With the hinged drain grille *B* lifted, the filter is then placed over another steam agitating pipe in the second tank which is filled with clean boiling-hot rinse water. After being thoroughly rinsed, the filter is removed from the second tank, the grille lowered, and the filter placed on it to drain for a short period. The lifting plate is removed and special light tongs, also shown in the drawing, used to lower the filter into the third tank which is filled with S.A.E. 40 oil, maintained at a temperature of 150-175 deg. F., with a minimum oil level of 20 in.

On removal from the oil-dip tank, the filter is placed on the adjacent steel drain board just ahead of the flat oven. When space is available inside the oven, simply raising the vertical sliding door will permit the hot filter to roll into the oven without being touched manually. Filters are removed from the oven by opening the sliding door at the right and stored in a clean dry place.

In the case of flat filters, a three-way adapter plate with lifting U-bolt at the top supports three filters in a vertical position in such a way that, when inserted in the various solutions over the steam agitator pipes, water is forced through the filters. The flat filters are placed in the underneath bin-type ovens for draining.

In the case of Michiana lubricating-oil filters, four of which are required per engine, the filters are moved from the locomotive to the cleaning department by means of the two-wheel cart, shown in one of the illustrations, which has a capacity to hold 16 filters at one time, or enough for one four-unit locomotive. When necessary, the filter cart can be drained of oil accumulated in the bottom by means of the valve ilustrated.

On receipt at the cleaning department, four of these filters may be cleaned in the special device shown in another view, and the old packing removed either by pulling out the sock-type filter element, if used, or the special waste still extensively employed. In the latter case, a cork-screw-type puller which permits removing the waste as a unit with little danger of damaging the filter is much preferred to a pointed steel hook as this may catch in the thin perforated side walls of the filter.

The special sheet metal table, shown in one of the illustrations, is mounted on an angle-section frame work at a convenient height and equipped with a quick-clamping arrangement to accommodate four filters at a time, or one engine set. Waste which is removed falls into the welded sheet-metal container at the front of the table and is subsequently disposed of. The filters are thoroughly wiped out and, in case sock-type filter elements are used, a new element is slipped into the filter, the round cover plate applied, also the locking ring and handle.

Where waste-type packing is used, the required amount is hand packed and forced into the filter and the round cover applied in the usual way. Since this filtering waste must not be packed so loosely as to be ineffective or so tightly as to block the flow of oil, it has been found good practice to use Wastex, supplied in 7-lb. bags, one of which is just enough to fill a single filter to the required density, if uniformly distributed.

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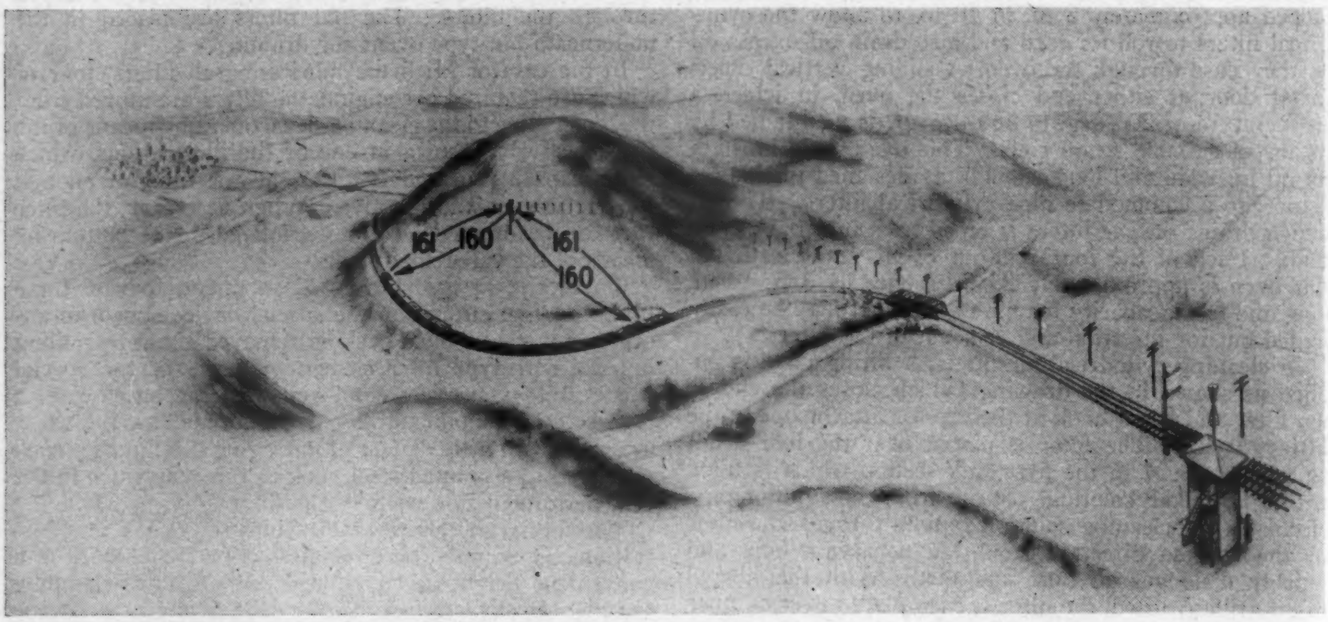
One-piece cast steel cylinders being applied to locomotive front frame at the Albuquerque, N. M., shops of the Santa Fe

ELECTRICAL SECTION



Wayside VHF communication system using telephone wire station interconnection

Experience With VHF Radio*

By L. J. Prendergast †

Some answers to questions concerning range, type of application, equipment, maintenance requirements, operating rules, power supply, and use of radar

On the Baltimore & Ohio our train communication tests have been confined exclusively to the use of very high frequency radio and we have no personal experience with the so-called "carrier system." It is our opinion that for yard and terminal operation, VHF radio has definite advantages over the inductive system, that the same advantages exist for front-to-rear train communication, but that in the field of talking from the train to a wayside point or the division office, the advantages of radio are not as pronounced and we hold an open mind concerning the relative advantages of radio or carrier to this particular type of application.

Tests Show More Than Line-of-Sight Transmission

We have made extensive tests in the Baltimore, Md., terminal area. This, incidentally, is our largest and most important terminal point consisting of five major yards with numerous transfer runs between the yards and also a considerable number of interchange movements with foreign roads each day. One antenna was used for the fixed station in our Baltimore test and was located on the roof of the Baltimore & Ohio building, a 13-story building, located nearly in the geographic center of the downtown portion of the city. From this station, it was possible to cover our entire Baltimore area. The frequency used for these tests was 156.25 megacycles.

Theoretically, radio transmission at frequencies in the neighborhood of 160 megacycles is supposed to have a "line-of-sight" range; that is, you transmit where you can see. Very early in our Baltimore tests, it was quite apparent that we were receiving intelligible radio signals where "line of sight" conditions could not exist and as the tests progressed it became evident that in urban areas with large masonry buildings containing quantities of glass areas, these were acting as efficient reflectors resulting in multiple path transmission and signal reinforcement and insuring good signal levels entirely beyond the line of sight under some of the worst imaginable conditions.

On our tests in the Baltimore area, good transmission was effected to all points in the Baltimore terminal from the one station located on the Baltimore & Ohio Building.

The results in the Baltimore area were sufficiently sat-

* Abstract of a paper presented before the Southern and Southwestern Railway Club, Atlanta, Ga., January 17, 1946.
† Superintendent communications, Baltimore & Ohio, Baltimore, Md.

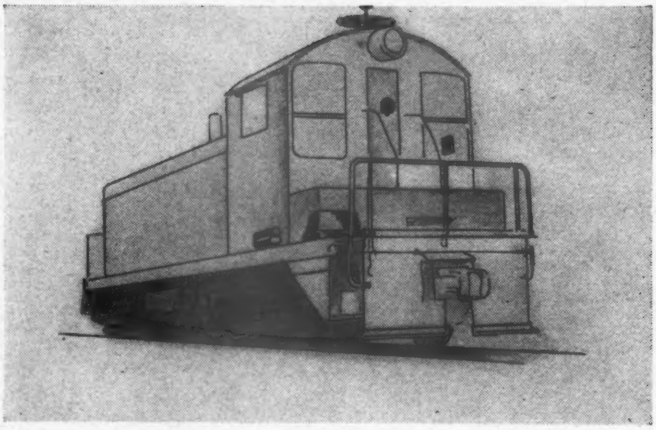
isfactory to justify the management in authorizing the equipping of the railroad's New Castle, Pa., yard with radio to promote the efficiency of yard operation. New Castle is a large hump yard and severe fog conditions frequently exist. This was the primary reason for installing the apparatus at New Castle—that is, to use it for hump engine operation, especially to keep them working in thick weather. It has been found, however, since the installation was made that it is of value in communicating with the trimmer engine and has been used on some occasions to dispatch a switch engine to a line-of-road job to meet an emergency condition.

The Transportation Department of the Baltimore & Ohio is quite convinced that the use of radio in yard and terminal operations will result in sufficient tangible savings to make the installations attractive from the standpoint of economics. We are not quite so convinced from a dollar and cent standpoint for front-to-rear and wayside-to-train applications. It must be remembered that on the Baltimore & Ohio, as on most of the other eastern trunk line railroads, our heavy traffic is moving on multiple track routes. These same economic advantages might not exist if we were dealing largely with single track operation on our heavy traffic density lines.

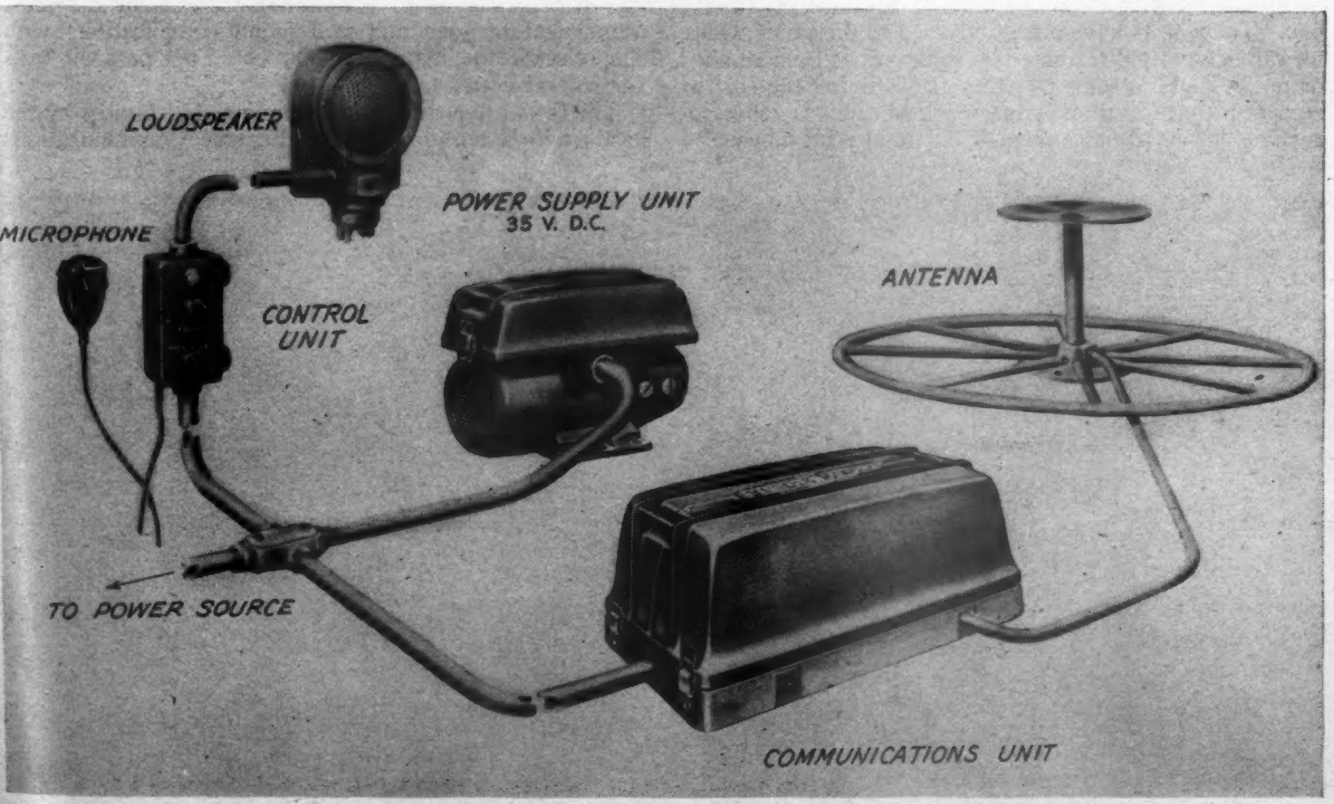
Equipment Used

The tests we have made and the permanent installation we have at New Castle have been made with apparatus manufactured by the Bendix Radio Division of the Bendix Aviation Corporation. The radio apparatus which is contained in a cast aluminum case is shock mounted, the assembly can be removed from the case for maintenance purposes and a new unit substituted in a matter of minutes. The power unit is mounted similarly to the radio equipment for easy replacement. The antenna consists of a counterpoise in the form of a cartwheel which is mounted directly on the roof of the car, caboose, or engine tender and from the center of which, and extending for 14 inches, is a vertical radiator used as the actual antenna. The control box has a switch for connecting channel one, channel two or switching off. The sets we are using at present have two frequencies available for both transmitting and receiving so that two channels of communication may be provided. The loud speaker, microphone, control unit, power supply unit, communication unit, and antenna are all shown in the illustration as being connected together by means of rigid conduit. This apparently is the most effective way of wiring up the various individual components.

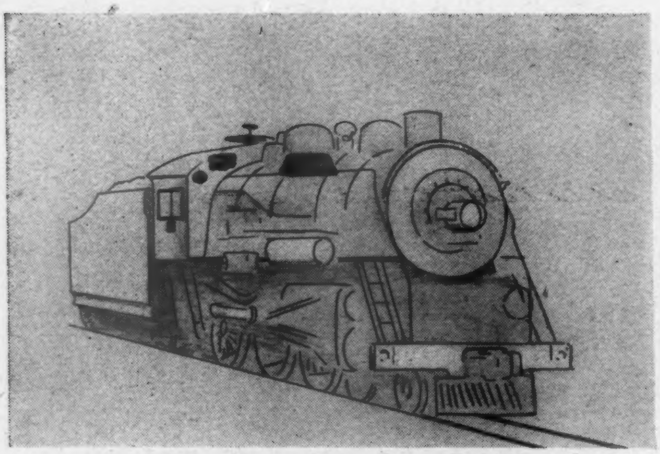
Another advantage of VHF radio is that the wave length at 160 megacycles is about two meters long. The length of the antenna is usually ¼ of a wave length, or ½ a meter. It means that the antenna as a vertical radiator would be between 15 and 20 inches long. This is an important consideration in railroad usage because of the close clearances ordinarily encountered. In fact, some recent tests we have been conducting on passenger equipment indicate that with an antenna 14 inches high



Location of communication equipment on a Diesel switcher



Complete communication apparatus for a caboose or locomotive, exclusive of the power source



Proposed method of placing equipment on a steam locomotive

we will have difficulty in meeting clearance conditions on our railroad. At one point, maximum clearance is just 15 ft., and at several points is between 15 ft. 3 in. and 15 ft. 6 in. In most of the passenger cars that we have encountered, the roof is 14 ft. above the rail and it appears that this particular problem of installations on passenger equipment is one to which more study will have to be given. In the case of cabooses and engines, the clearance requirements are less stringent as the antenna can be mounted on the tender of the engine and on the roof of the caboose below the cupola.

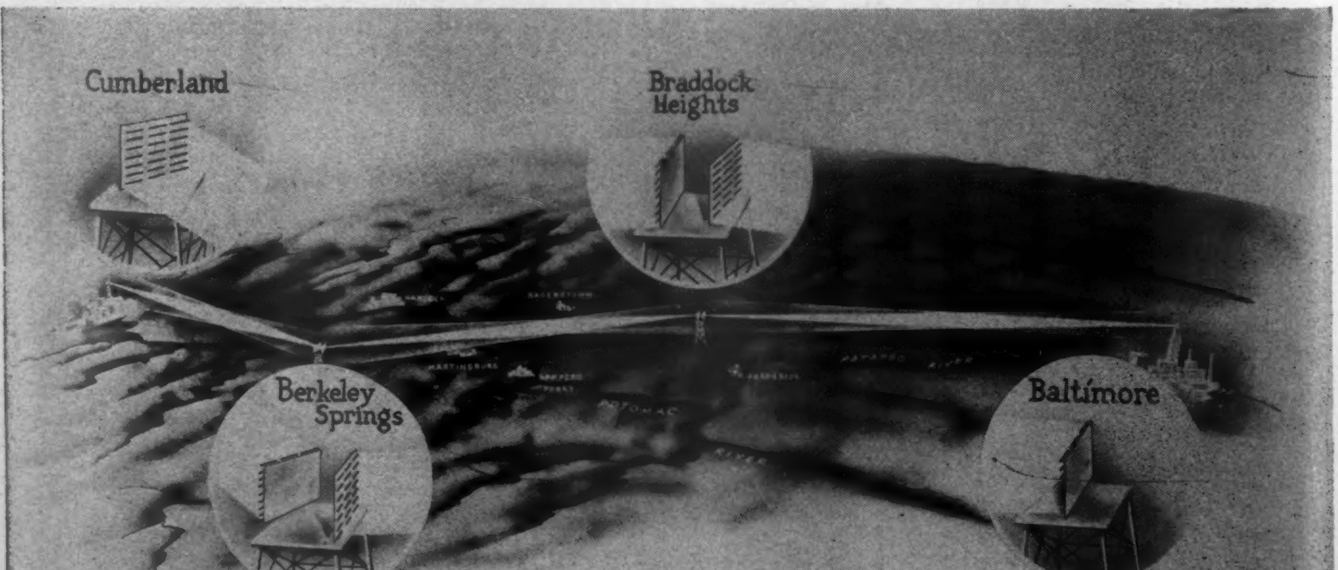
We have made tests covering front-to-rear end communication on freight trains and these tests also, from a radio standpoint, were very satisfactory. The only time that communication was interrupted was when the train was in a tunnel. Some thought has been given to the question of continuous communication through tunnels and the Bendix Radio Division is at present conducting a test in a 2,700-ft. tunnel on the Baltimore Division of the B. & O. to determine if communication can be effected through tunnels as long or longer than this one. These tests have not progressed to the point where we can definitely determine if a solution has been reached or not. There is some question of justifying the cost of reception through tunnels inasmuch as tunnels represent such a very small percentage of our total road mileage.

We have ordered ten Walkie-Talkie sets for experimental purposes but have not as yet received delivery. There apparently are many places in railroad operation where small sets of this type may fill a long felt need. Signal maintainers, in adjusting the shunt resistance of track circuits, may use them to talk back and forth between the battery location and the location of the shunt resistance. Signal maintainers could also use them effectively in focusing automatic block signals. The foreman of the relief train might utilize such a medium of communication to good advantage in talking to his force at derailments or other pile-ups and section forces could probably make good use of them in numerous ways.

Maintenance to Be Joint Responsibility

The question of maintenance of this equipment is an important one. The subject has been investigated by the Eastern Conference Committee, and on the Baltimore & Ohio, and I think on most of the other eastern railroads, the Motive Power Department will be responsible for the installation and maintenance of the radio apparatus on locomotives, cabooses, and all other rolling stock. The Communications Department will be responsible for the installation and maintenance of apparatus at all fixed locations. One of the requirements of the Federal Communications Commission is that only persons holding at least a second-class telephone or telegraph operator's license may make any adjustments to the transmitter equipment or repair any defects which may appear in the transmitters. On the Baltimore & Ohio, such licensed personnel will be largely confined to employees of the Communications Department. We have several such employees on our payroll now, and will probably need additional ones. It is proposed that the electrical force of the Motive Power Department will merely replace the defective unit with a good one held in stock for that purpose, and that the defective apparatus be turned over to the Communications Department for check and repair at a centralized service shop. It is felt on our road that this will enable us to maintain these sets in the most economical manner and will avoid complications with shop electricians, many of whom could not pass the tests for federal licenses.

The tests are conducted throughout the country by the local radio inspectors of the Federal Communications



Relay point-to-point VHF communication

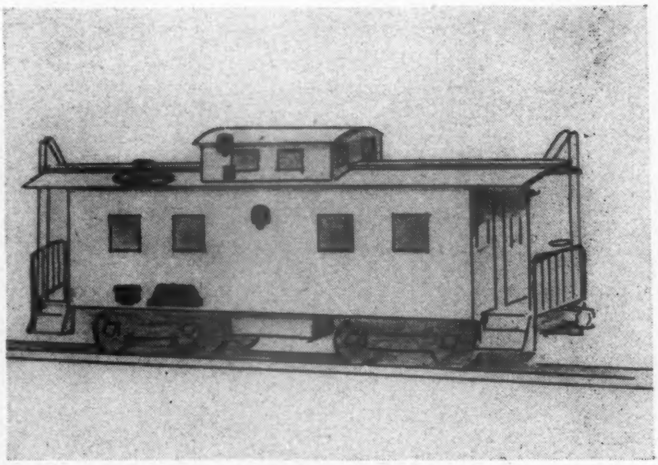
Commission and consist of written examinations in radio theory and in radio law and commission regulations, and in the case of telegraph licenses, proficiency in the International Morse code. While the test is not too difficult for an experienced radio mechanic, it might present substantial difficulty to a more elderly electrician, who is not familiar with electronic circuits at all. There is no charge for the test, nor for the issuance of the license.

Commission Requirements

The Federal Communications Commission has recently issued two important orders in connection with railroad radio. Its order No. 126, dated August 21, 1945, provides that railroad personnel using radio transmitters and receivers in the usual course of their business need not be licensed by the commission but must be examined by the railroad rules examiner at bi-annual intervals on simple rules relating to radio, with which the commission feels all persons using a transmitter should be familiar. Records must be kept by the railroad of such examinations, and these records are subject to periodic inspection by a representative of the commission. This concession on the part of the commission represents the first time the commission has waived its usual requirements that all persons using radio transmitters must be licensed directly by the commission. The other order, issued December 20, 1945, embodies the actual operating and technical requirements under which railroad radio service must be carried out. These rules are sufficiently broad so that no railroad should feel alarmed concerning any of their provisions. The rules were worked out through the cooperation of the Association of American Railroads and the staff of the Federal Communications Commission.

Power Supply

The question of power supply for these radio sets located on railroad rolling stock is one that has received considerable attention in the last year or so. The Mechanical Division of the Association of American Railroads has had a sub-committee actively working on this program and some progress has been made by this sub-committee. The Communication Section and the Mechanical Division have held joint committee meetings and it has been decided, as an association policy, that all transmitters and receivers, both for fixed stations and for installation on rolling stock, shall operate at a voltage of 117 volts a. c., 60 cycles. This decision, of course, is a compromise between several conflicting opinions and conflicting reasons. The advantages gained by standardizing on this voltage are that all of the sets, both fixed station and rolling stock, are completely interchangeable and that no conversion equipment is necessary at test benches where service work is performed. It assists the set manufacturers in standardizing and permits the railroads greater ease in making comparative tests.

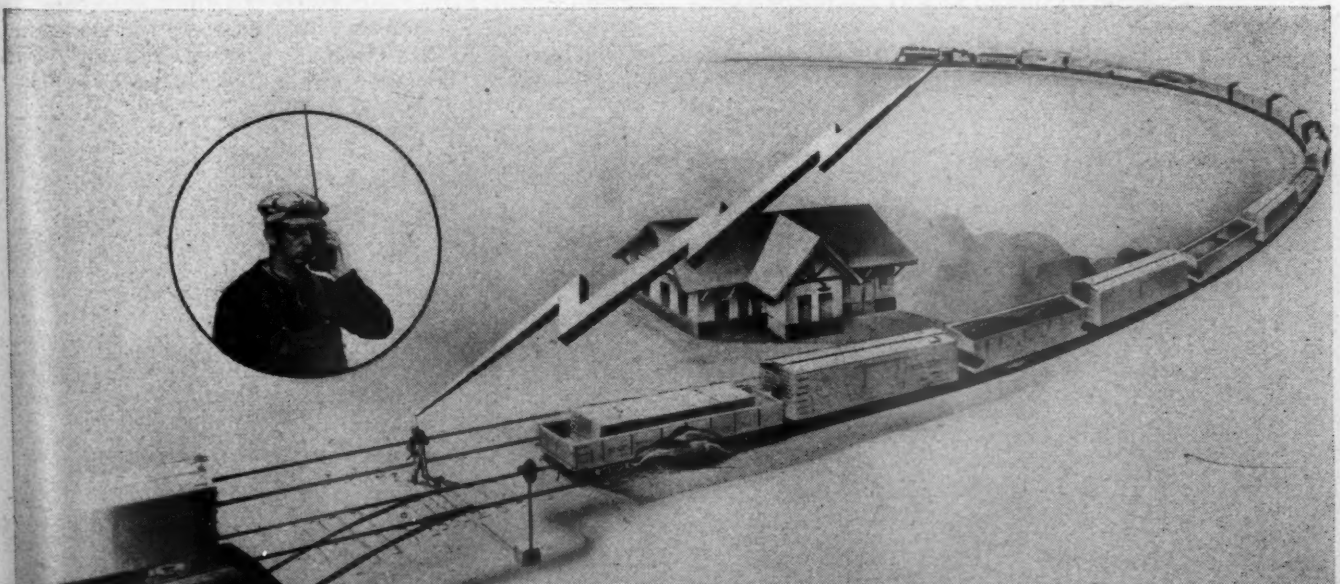


Typical caboose installation

Rolling stock at the present time will ordinarily have 32 volts d. c. supply on passenger equipment and on steam locomotives. The supply on Diesels varies, but 64 volts and 110 volts are relatively common voltages. It is thought that in the case of steam locomotives, independent turbo-generators supplying 110 volts a. c. may be used, or, I understand, that one of the larger manufacturers is prepared to offer a turbo-generator with dual windings so that a single generator may supply 32 volts d. c. and 117 volts a. c.

The question of an adequate power supply on cabooses is one of the most difficult problems which must be worked out by the mechanical and electrical engineers as radio installations become widespread on this class of equipment. Some progress has been made but consider-

(*Continued on page 150*)



One application of walkie-talkie communication

A single-end trailer coupled to a locomotive

Diesels for Hump Pushers

Addition of electric trailers to locomotives increases tractive force and permits sustained heavy load operation at speeds of two to four miles an hour

THE New York Central now has in service five exceptionally effective hump-yard pusher locomotives, each consisting of one or two Diesel-electric locomotives with trailer. A sixth trailer will soon be completed.

The trailers were made by converting some of the railroad's earlier type electric and Diesel-electric locomotives for coupling them to one or two Diesel-electric switchers. There are four trailers designed for single-end operation with either a 600-hp. or a 1,000-hp. Diesel-electric switcher and one for double-end operation with a 1,000-hp. locomotive at either end of the trailer. The unit under construction will be arranged for double-end operation.

The trailers serve to add tractive force and sufficient motor capacity to permit moving heavy trains over the humps at speeds of two to four miles an hour. When the pushing is completed, the trailer motors are disconnected, and the trailer may then be hauled away from the hump by the locomotive at any speed up to 40 miles an hour.

The single-end trailers, made from type RA electric locomotives, weigh 253,700 lb. The original locomotive cabs were removed and replaced with housings much lower than the original cab. The two housings at the ends each contain a sand box and ballast. Control equipment and a motor-driven blower for cooling the traction motors is placed in the center housing. Added weight is made up of one layer of ballast consisting of scrap rails or 4-in. plates placed on the floor casting, of ballast blocks in

Double-end trailer with two 1,000-hp. Diesel-electric locomotives

Controller showing air-operated throttle which has been added to locomotives used with the double-end trailers

openings in the underframe and scrap rails and concrete at each end over the center plates.

Trailer motors are GE-286 with 69/20 gear ratio. In service, the single-end trailers are placed ahead of the locomotive. They are designed for operation with either 600-hp. or 1,000-hp. Alco locomotives because these locomotives have series-parallel control and trailer and locomotive motor characteristics are essentially similar. When the trailer and locomotive are operating together, all motors are connected in series. The control is interlocked so that the locomotive motors cannot be connected in series-parallel when the motors on the trailer are in the circuit. A switch at the locomotive control position cuts out the trailer motors, permitting series-parallel operation of the locomotive motors at speeds up to 60 m.p.h.

On the single-end trailer, the blower motor, rated 19.5 hp. at 1,260 r.p.m. drives a blower which delivers approximately 8,500 c.f.m. at 4 in. pressure. The motor receives power directly from the locomotive traction generator, and its speed varies with the generator voltage. On the return trip from the hump, the blower motor is kept running even though the trailer traction motors are cut out. This assures low motor temperature at the beginning of each pushing operation.

Both trailers and locomotives are equipped for weight compensation. This consists of applying a shunt to the field of the leading motor on each truck since this motor drives the more lightly loaded axle. On the 1,000-hp. locomotives, this is accomplished by a foot switch and is automatic on the 600-hp. locomotives.

Control equipment on the trailer includes contactors and reverser. These are operated remotely by the locomotive control. The locomotive controller is operated normally, and it controls operation of trailer contactors and reverser as well as those on the locomotive.

Locomotive and single-end trailers are connected electrically by one 7-conductor jumper, one 16-conductor jumper and two bus jumpers with corresponding receptacles respectively on the locomotive and the trailer.

Double-End Trailer

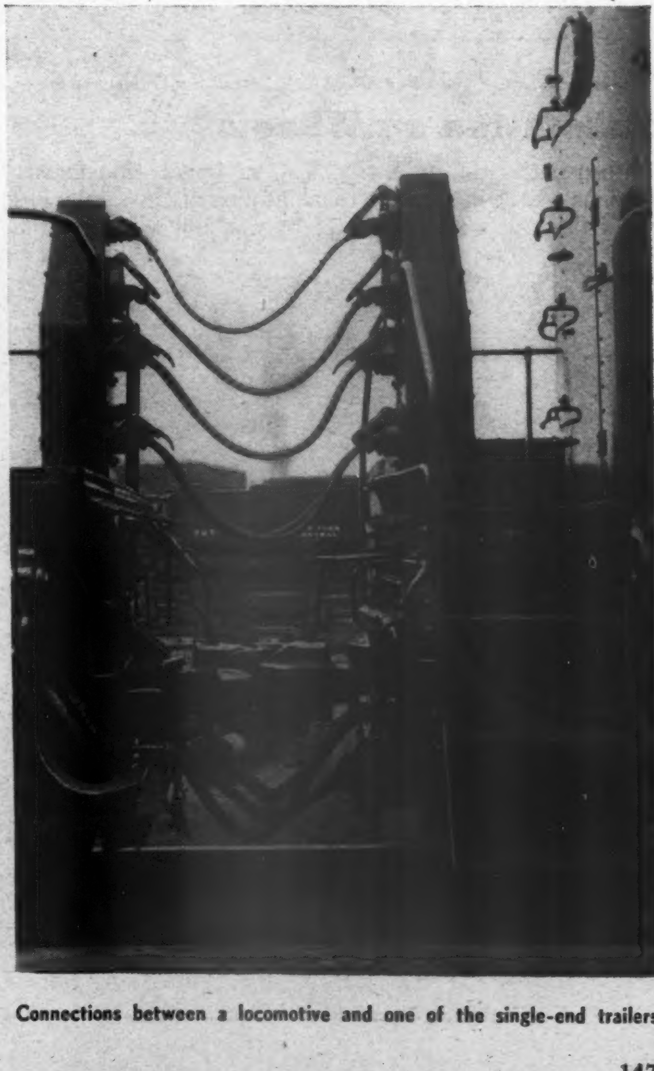
The railroad has equipped one double-end trailer and a second is nearing completion. This is operated between two 1,000-hp. locomotives. The trailer now in service was made from the original "three-power" locomotive designed for operation from a Diesel power plant, or a battery on the locomotive, or from the third rail in the New York electrified territory.

Each locomotive supplies power to its own driving axles and to the motors on one trailer truck, making two groups of 6 motors in series each for pushing service. There are two blowers on the trailer, each supplied from the generator of the adjacent locomotive.

The trailer weighs 266,100 lb., the ballast consisting of a number of layers of scrap rails, all on the top deck. There is a blower and sand box in a housing at each end of the trailer, and control apparatus is located in a center housing. A switch connects all motors on trailer in series if it is desired to use the trailer with only one locomotive.

The locomotives used with the double-end trailers are equipped with air-operated throttle control in order to secure multiple-unit operation of the two locomotives. Brakes on the trailers are straight air and sanders are electro-magnetically controlled from the locomotive.

One single-end trailer is used with a 600-hp. locomotive on the westbound hump at Gardenville, N. Y., south of Buffalo, N. Y., one with a 1,000-hp. locomotive on the



Connections between a locomotive and one of the single-end trailers

Motor-driven blower and control equipment on a single-end trailer

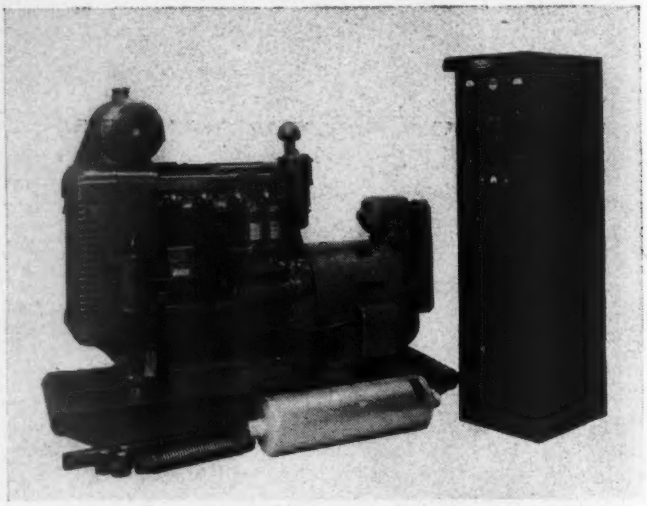
westbound hump at DeWitt, N. Y., near Syracuse, N. Y., one with a 1,000-hp. locomotive on the westbound hump at the Selkirk yard, south of Albany, N. Y., and one with a 1,000-hp. locomotive at Detroit, Mich. The double-end trailer is in service in the eastbound DeWitt yard.

A single-end trailer with a 1,000-hp. locomotive will develop 119,500 lb. tractive force, and with a 600-hp. locomotive, 109,000 lb. Two 1,000-hp. locomotives with a double-end trailer have a maximum tractive force of 171,000 lb. For humping operations, a single-end trailer and locomotive handle trains of approximately 4,000 tons, and a double-end trailer with two locomotives approximately 8,000 tons, without overheating of the traction motors. The capacity of the generator is adequate in all of the trailer applications.

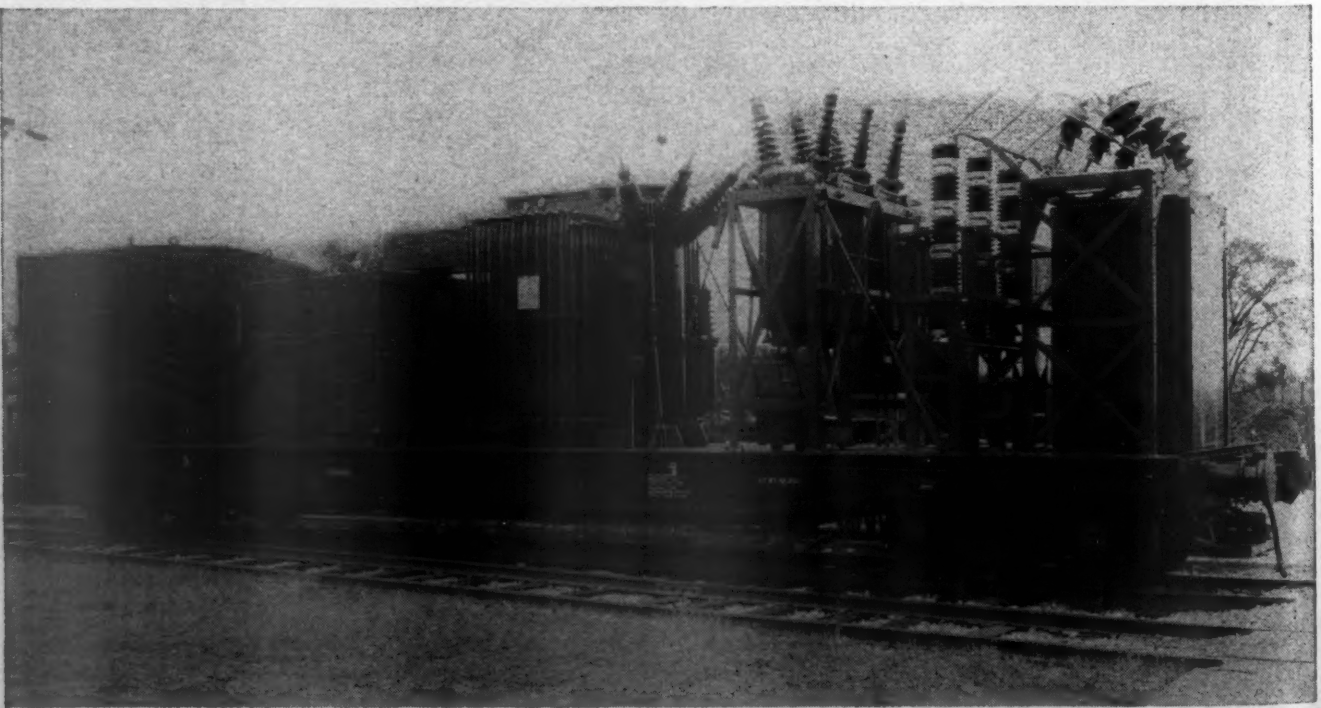
Substation on Wheels

Fifteen American-made mobile step-down transformer stations will be used in the rehabilitation of Russian towns and cities that were devastated by war and will serve the electrical needs in wartorn areas and maintain service until permanent substations can be built for these areas. The substation, made by the General Electric Company, permanently mounted on a flat car weighs 111,000 lb. It is rated 1,800 kva. with a high voltage of 35,000 volts, which can be stepped down to 3,150 or 6,300 volts.

Auxiliary power sets mounted in a steel cubicle at one end of the car supply power for cabinet lighting, for operation of power tools used for substation maintenance, and for operation of the circuit breaker mechanisms which open or close the circuit breakers. The set consists of a 15-kw. Diesel-engine-generator set made by the International Diesel Electric Company, Long Island City, N. Y. The set is self-contained in that it includes the engine and a.c. generator, fuel tank, muffler, exhaust line, complete electric starting equipment including batteries, and a switchboard for generator control with an automatic voltage regulator. The engine is also equipped with a gasoline heater to facilitate easy starting in frigid climates.



Auxiliary power is supplied by a 15-kw. Diesel-engine-generator set



Railroad-mounted unit substation built by the General Electric Company for the Russian Government

Power Supply For

Communication Equipment

By J. J. Kennedy*

Design of motor-alternators for passenger car fluorescent lighting adapted to meet conversion needs of train communication

For operating communication equipment on railway cars, alternating current power sources, having a high degree of refinement both of frequency control and voltage regulation, are immediately available, as a result of developments in power supply sources for general radio purposes for the U. S. Navy during the war.

These small units are, in general, similar to the larger units pioneered by the Safety Car Heating & Lighting Company, for conversion of direct current to alternating current for fluorescent lighting on railway passenger cars. Hundreds of these machines are already in service on railroads throughout the country.

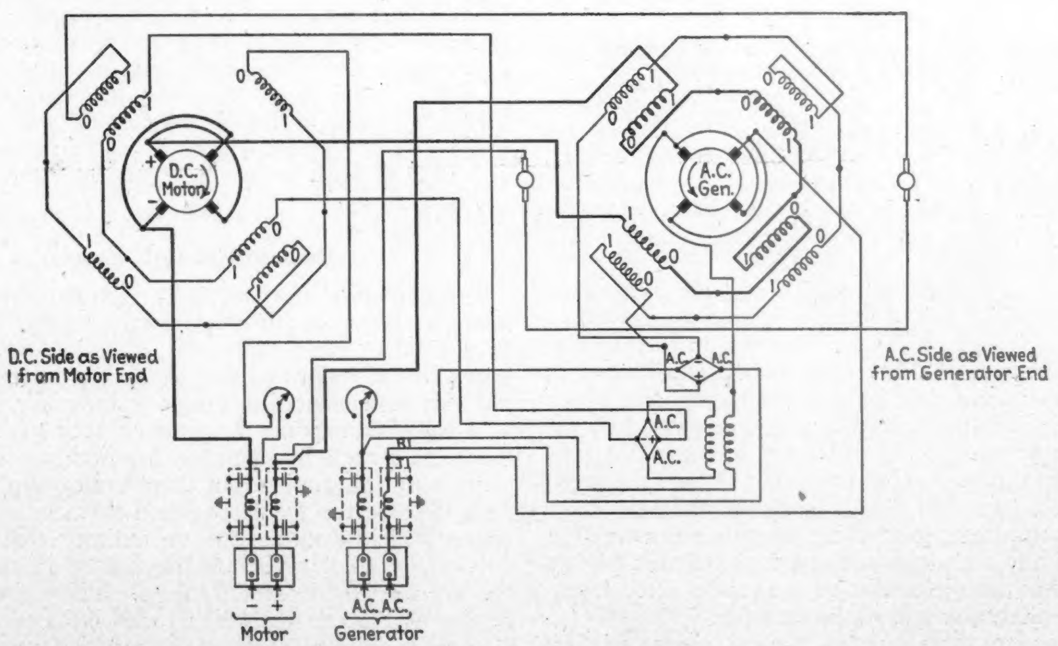
For communication purposes, two major refinements have been added; the use of filters both on the d.c. and a.c. sides of the machine or on the a.c. only, as required, and the excitation of the alternator from the a.c. line by means of a selenium rectifier. These features are combined with those of passenger car motor-alternators to produce a rugged unit having low radio noise level and consistent performance of frequency and voltage regulation which is eminently well suited to the requirements of railroad train communication.

Available in various sizes, the units for communication purposes are furnished for all voltages used on railway equipment and in capacities to fit the various requirements. They have been tested and approved by the Navy, ship-to-shore communication companies, and manufacturers of railroad communication equipment.

The units are self-contained and have inherent frequency and voltage regulation. No mechanical speed governor, with its attendant evils of contact burning and radio noise, is used.

The motor and generator are combined in a single frame. A terminal box of liberal proportions provides access to both motor and generator terminals and houses the filter units and control equipment. There are also two adjustable resistors in the terminal box. One is in series with the motor shunt field, and permits accurate initial adjustment to the desired 60-cycle value. The second resistor is in the alternator field and provides for increase or decrease in a.c. voltage to suit any operating condition desired.

Both motor and generator armatures are mounted on the same shaft, which is carried on ball bearings of liberal dimensions. Collector rings are made from forgings of bronze alloy.



Wiring diagram for a motor-alternator as filtered for radio use

The motor armature is wave wound, permitting the use of two brushes in parallel 180 deg. apart, accomplishing the best commutation. Two brushes are similarly used in parallel on each collector ring. A series field on the motor assures quick starting with low inrush current.

With the range of input voltages on the equipment furnishing the power on railroad rolling stock, these motor alternators will maintain both the frequency and voltage within limits satisfactory for proper operation of

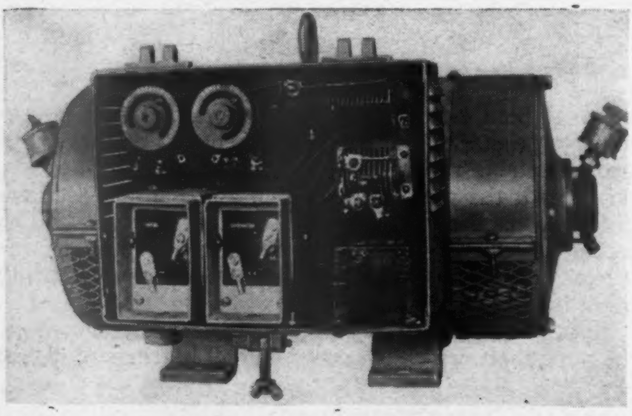
* The Safety Car Heating & Lighting Company, Inc.

all types of communication equipment within the rated output of the machine.

Voltage and Speed Regulation

Inherent regulation is accomplished by the use of two electrical devices. Compensating resistors in the motor field circuit correct for speed changes caused by variations of the voltage impressed on the motor. Changes in speed due to load are eliminated by the use of auxiliary coils on the motor field, producing excitation counter to the main shunt field as a function of a.c. load. This is accomplished by the use of a series transformer, the primary of which is in series with the a.c. load, and having the secondary connected to a small selenium rectifier. The rectified current is used in the auxiliary or de-magnetizing field on the motor.

As load is added to the alternator, the current in the rectified circuit increases in proportion to the load. Since the auxiliary field coils, energized through the rectifier, are in opposition to the main motor field, the total effective motor field is weakened, as the a.c. load is increased, thus holding the motor speed within close limits for all conditions of load.



The motor-alternator with the terminal box open showing the filter units, variable resistors, rectifiers and transformer

An increase in voltage impressed across the compensating resistors, which are in series with the shunt field of the motor, is accompanied by a decrease in their resistance. The amount of this change is so proportioned in relation to the shunt field coils of the motor with which they are in series, that voltage changes impressed on the motor instantly change the resistance of the shunt field circuit so that the field current required to hold the speed reasonably constant will be automatically maintained.

The compensating resistors are rugged in construction and hermetically sealed against moisture and dirt. They are mounted as complete units on the inside of the frame arms on the alternator end of the machine.

In addition to their current control characteristics, these units also have a temperature characteristic which compensates for speed changes caused by heating of the motor windings. The series transformer and rectifier are located in the control box on the side of the machine.

To maintain the a.c. terminal voltage from no-load to full load, compensation for drop in voltage with load due to armature impedance is obtained by the use of series coils on the alternator field poles. These carry motor current which is substantially in proportion to a.c. load and therefore, compensate for voltage drop by increased field excitation in much the same manner as a compound wound d.c. generator.

These motor-alternator units can be started directly across the line or operated automatically by across the line starters of the same type which are now used for operation of similar machines used for fluorescent lighting. Resilient mountings are available.

Experience with VHF Radio

(Continued from page 145)

able difference of opinion exists concerning the best method of accomplishing the results. Storage batteries employing terminal charging only are advocated by some. One or more roads have used small gasoline-driven generators. The presence of gasoline in cabooses is unsatisfactory from a fire hazard standpoint, and some experiments have been made using a small Diesel engine and also an engine operated by butane gas. The question of cost, and the operating characteristics of caboose equipment, i. e., the slow operating speed of some of this equipment and the relatively long periods of non-mobility, make this problem a difficult one.

It appears that the cost of these radio sets at the present time and probably for some time in the future will be about $1,000 per unit installed. This does not include the cost of any changes or additions which must be made in the power supply of the unit of rolling stock on which the apparatus is to be installed.

All previous reference to manufacturer has been confined to Bendix since it is the type of apparatus with which we have been working. The Westinghouse Electric Corporation, the General Electric Company, through the General Railway Signal Company, the Farnsworth Radio Corporation, the Television Company, the Aireon Corporation, the Galvin Manufacturing Corporation and McGuire Industries, are all conducting tests on different railroads and they all will be in a position soon, if they are not at present, to provide satisfactory radio apparatus for railroad use.

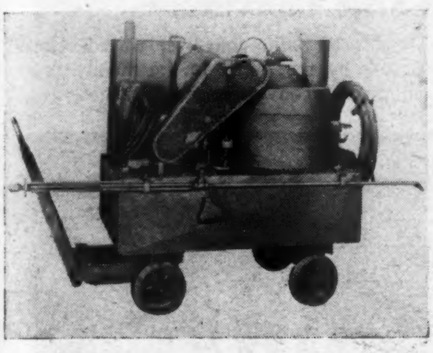
Possibilities of Radar

Great interest, especially on the part of the lay people, seems to exist in an automatic warning device which might be utilized to avoid collisions. The publicity which has been given to radar and the part that it played in winning the war, has enhanced this interest and made many people ask why radar cannot be used on trains. So far as I know, no serious investigation has been made by anyone concerning this subject but there are certain self-evident facts in respect to the propagation characteristics of radio waves which would seem to indicate that success is dubious. Radio waves are propagated in straight lines and are reflected in straight lines. This principle of reflection is the one on which radar is based. With the extremely crooked right of way which most railroads have, in at least part of their territory, there is no way, so far as I know, to bend these radio beams around curves. There is also the question of large fixed structures adjacent to railroads which would act as reflectors if there was the slightest curvature. There is also the question of reflection from trains on the opposite track in the case of double track, or multiple track operation. All of these factors would seem to indicate that use of a radar warning device involves difficulties which probably will not be overcome. Of course, we have seen so much accomplished that was, at one time, classified as "impossible" that a prediction that this could not be solved would be foolhardy. All I can state is that at present it is not solved, nor does an early solution seem probable.

NEW DEVICES

Steam-Cleaning Unit

A self-contained steam-cleaning unit has been developed by Oakite Products, Inc., 46 Thames Street, New York. Known as the Oakite-Vapor cleaning unit, it delivers hot vaporized cleaning solutions under



Oakite-Vapor steam-cleaning unit

pressures up to 200 lb. per sq. in. to one or two steam guns.

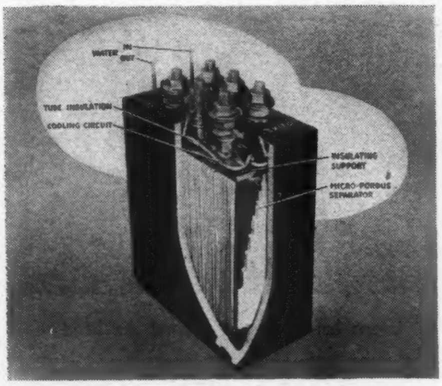
The oil-fired generator is of the enclosed coil-type and uses a wide range of fuel oils, such as No. 1, No. 2 or No. 3 fuel oil, kerosene or gasoline. It is capable of generating a pressure of 100 lb. per sq. in. in one minute or 200 lb. per sq. in. in two minutes. The unit has an 80-gal. solution tank that permits continuous operation for approximately 1½ hr. when one gun is used.

The basic unit is 48 in. long, 30 in. wide, and 42½ in. high and weighs 805 lb. The hose rack on the end increases the overall length to 54½ in. Mounted on shop wheels and chassis the total weight is 990 lb.; enclosed in a metal hood on a pneumatic-tired trailer chassis, it weighs 1,365 lb. Power for driving all mechanical parts is furnished by a ¾-hp. electric motor. The equipment meets code standards for safety.

Water-Cooled Batteries

Water-cooled storage batteries have been developed by the Electric Storage Battery Company, Philadelphia, Pa., for use with battery-powered resistance welders, made by the Progressive Welder Company, Detroit, Mich. The water cooling permits high charge and discharge rates for welding aluminum and other metals or alloys requiring high fusion currents. Other advantages are decreased battery maintenance, longer battery life, more constant operating temperature and less flushing.

Cooling of the cells is accomplished by use of some 50 in. of ¼-in. O.D. lead tubing in the electrolyte near the top of the cells. Tap water is circulated through the tubing at a rate determined by the requirements of the operation. The tubing is insulated from the plates by hard rubber insulators and from the terminals by rub-



Cutaway view of one of the water-cooled batteries

ber sleeves. Cooling of the electrolyte is thus carried on at the highest temperature level. Positioning of the cooling circuit near the upper surface of the electrolyte also materially reduces the formation of water vapor and reduces the loss of electrolyte associated with uncooled batteries.

The battery, except for the cooling, is an adaptation of a war-time design for maritime service in which high capacity, dependability and a minimum of maintenance were essential.

The battery-powered welders are particularly suitable for use in localities where electrical power facilities are not sufficient to handle the high demands imposed by conventional resistance welding equipment. In some cases, even where power facilities are adequate, the lower plant investment and lower maintenance and operating costs associated with storage battery welders may result in a reduction in the unit cost of welded products.

Radial Cone Loudspeaker

The Model RBP-12 illustrated and a smaller RBP-8 are infinite baffle housings for cone type loudspeakers, made by University Laboratories, 225 Varick street, New York 14. They are designed for high quality reproduction of music and speech, their infinite baffle design providing good

The model RBP-12 housing may be used with any standard 12-in. cone speaker

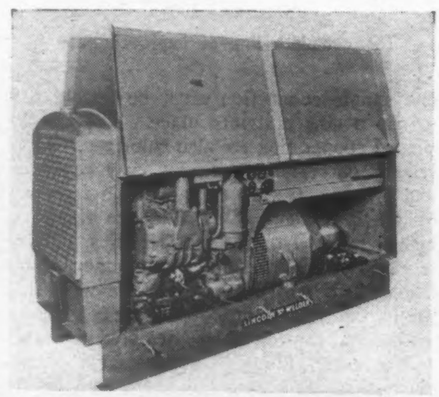
low-frequency response. Both speakers are rubber-rim-damped to eliminate mechanical resonance. They are engineered for 360-deg. sound dispersion and incorporate construction features that reduce undue sound concentration directly beneath the speaker. The projectors are water-shedding and can be used outdoors.

Diesel-Driven Welder

A Diesel-engine-driven welder of 300 amp. capacity, for use in locations where electric power is not available or not economical, is announced by the Lincoln Electric Company, Cleveland, Ohio.

Engine features include a simplified fuel arrangement with complete fuel filtering system. The welding generator has an N.E.M.A. rating of 300 amp., at 40 volts. Current range for welding duty at 20 to 40 volts is 60 to 375 amp. The generator requires no external reactance or stabilizer and the control of welding current is accomplished by adjustment of both series and shunt fields.

The exciter and main welding generator



Lincoln Diesel-engine-driven 300-amp. welder

are electrically separate to improve welding performance and reduce upkeep costs. The exciter is direct-connected on the commutator end of the generator. All control parts are contained in a steel cabinet.

The generator frame is attached to the Diesel engine bell housing and the generator shaft is connected to the engine flywheel by a flexible coupling. The entire unit is mounted in a substantial channel frame.

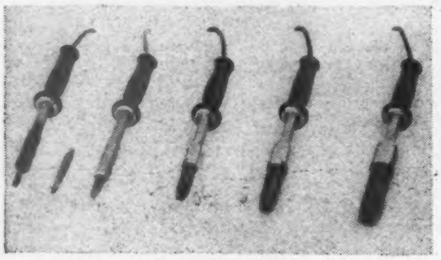
The pressed-steel canopy is supported by heavy structural steel members. Two side doors on either side are hinged at top and are fitted with spring fasteners at bottom. A hinged door at the rear of the unit allows access to the welder control panel.

The complete welder (stationary model) weighs 2,560 lb. and can be readily mounted on wheels, trailer or truck for easy portability. Optional equipment includes spring-mounted running gear of automobile trailer type with four-wheel pneumatic tires.

Industrial Soldering Irons

A line of industrial soldering irons has been announced by the Industrial Heating Division of the General Electric Company. Ranging from 75 to 300 watts in size and available with tips from ⅜ to 1¼ in. in diameter, the irons are designed primarily for severe and exacting soldering operations where fast, continuous, high quality soldering is required. They are also suitable for light, medium, and heavy intermittent soldering.

A feature of the irons is their quick recovery and high reserve-heat capacity, which permits soldering as fast and continuously as the character of the work allows. Calorized (surface-alloyed with aluminum) copper and 18-8 stainless steel are used for all parts subjected to high temperatures. This construction is combined with a Calrod heating unit to assure long life, uniform performance and low maintenance. The heating units can be easily replaced, since only



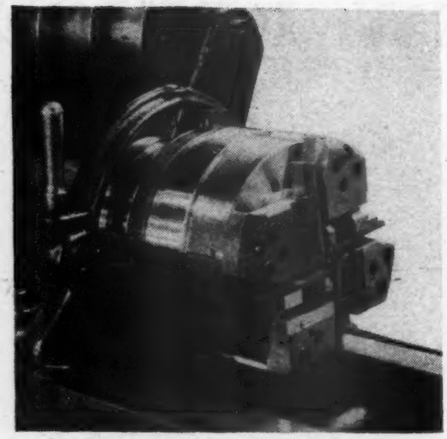
The complete line of improved irons

one simple connection must be unsoldered to slip a new unit into place. The chisel-shaped copper tips are also calorized, which retards corrosion, facilitates easy renewal, and prevents the tip threads from freezing to the tip holders. The irons are also furnished with Ironclad copper tips. The working ends of these tips are surfaced with iron, which will not amalgamate with the tin in the solder, as copper does. Hence pitting and erosion of tips are obviated and, consequently, filing is unnecessary. The plastic handles are cool and easy to grip.

Hardened and Ground Die Heads

The Landis Machine Company, Waynesboro, Pa., announces the availability of a new series of hardened and ground die heads, to supplement its present line. Heretofore, hardened and ground die heads of the Lanco type have been available up to the ⅞-in. size. The new series, identified as the Type VV, are available in the 1-in., 1½-in. and 2½-in. sizes for use on hand-operated threading machines. All parts are made of alloy steel.

The manner in which the chaser holders are clamped to the holder slides permits the removal of the holders from the face of the head for interchange without disassembling any part of the head or removing the head from the spindle. The slides are gibbed to the head body to provide compensation for wear. Zerk-type fittings are used to force heavy grease into the chaser slides and other operating parts to prevent the entry



Lanco hardened and ground die head

of fine cuttings which would cause excessive wear. Adjustment to less than a thousandth of an inch for size is obtained by means of a graduated adjusting ring at the rear of the head.

The die head has Lanrac chaser and chaser holders. This combination employs a rack tooth arrangement to locate the chaser in its approximate position after which an adjusting screw operating against the chaser clamp is employed to advance the chaser to the correct gauge setting position. This clamping arrangement permits adjusting the chaser to the proper gauge position with no more than three turns of the adjusting screw, thus saving considerable time in interchanging chasers.

Journal Jack

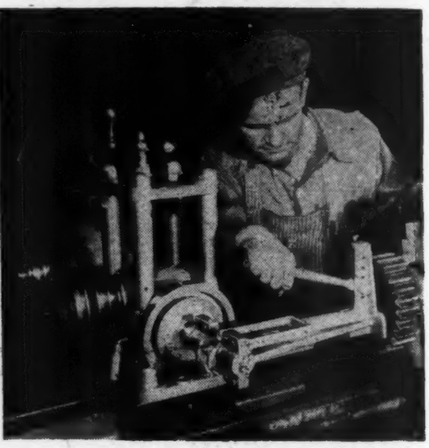
A journal jack with a minimum low height of 7 in. and a capacity of 35 tons is the latest railroad tool developed by the Malabar division of Menasco Manufacturing Company, Burbank, Cal. Equipped with a patented lock nut, this jack is designed to eliminate all possibility of settling or accidental lowering of the jack under load.

One of the principal uses of the Malabar journal jack is to speed up inspection of brasses. The low height permits spotting the jack under the spring bracket of the truck side frame so that both journals can be inspected with one lifting operation. Hydraulic lifting pressure is supplied by a fast, easy-acting hydraulic pump wholly enclosed within the oil reservoir.

Malabar 35-ton journal jack applied under a freight-car truck side frame

Lathe Converter

The Master lathe converter was developed for use by the Army in the mobile repair units. The converter, which is now available for commercial use, consists of a basic unit which will mill, bore and face, cut keyways, and do angular drilling. It is supplied with interchangeable heads to do external and internal grinding, and angular milling to cut threads, worms and screws; a broach attachment to cut internal keyways and internal splines; and a dividing head which, mounted on the open end of the



Master lathe converter with broach attachment for cutting keyways and internal splines

lathe spindle, positions the work piece for cutting and grinding gears and splines. All moving parts are mounted on ball bearings.

Internal and external thread milling, cylindrical and internal grinding, as well as boring and facing can be done by use of the converter, the lathe rotating the work piece while the converter does the specific operation required. Many operations normally requiring a jig borer or other machine providing a rotating table are practical by turning the lathe spindle with the dividing head, thereby positioning the work for cutting rack teeth or spacing drilled holes around a center.

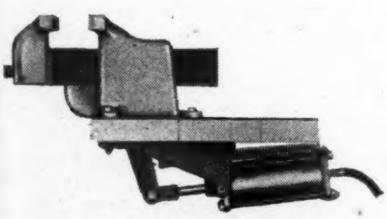
The Master lathe converter, manufactured by the Master Manufacturing Company, 1300 Avenue A East, Hutchinson, Kans., is made in three sizes for adaptation to all bench and engine lathes ranging in size from 9-in. to 36-in. swing. It can be used on any make of lathe. It is mounted in the tool-post position on either the compound rest or on the cross-slide of the carriage, with the compound removed.

Cleveland Steelweld shears have a pivoted instead of a sliding blade

Power Vise

The Bryant Products Company, Jackson, Mich., has announced a pneumatic pressure vise for holding, punching and forming operations. The vise is equipped with a regulator valve for adjusting the jaw pressure to any pressure up to 4,000 lb.

The jaws can be replaced with pipe jaws,



Bryant pneumatic vise

punches and dies, and forming dies. Both the cylinder and the piston rod are chrome plated. The jaws are 5 in. wide by 2½ in. deep by 8 in. safe opening and are controlled by a three-way foot-operated valve. The vise weighs 100 lbs.

Metal-Cutting Shears

The Heavy Machinery Division, The Cleveland Crane & Engineering Company, Wickliffe, Ohio, is introducing a line of power-driven metal-cutting shears, known as Cleveland Steelweld Shears. These machines employ a pivoted-blade principle and have no slides or guides to wear out of true and cause inaccuracies. The upper blade operates on two heavy pivot pins secured to the end housing and travels in a circular path.

A valuable feature is the ease with which the knife clearance may be varied to suit the thickness of the plate being cut. Turning a hand crank, conveniently located on the right-end housing, changes the gap between the knives. A large dial indicates the clearance in thousandths of an inch, and also shows the plate thickness that may be cut for any setting of the knife.

Steelweld Shears may be readily arranged for squaring, slitting, or set at any intermediate position for notching and firmly locked. This feature is included on all machines with standard 24-in. deep throats, but is not furnished on the smallest size, where the throat depth is 18 in.

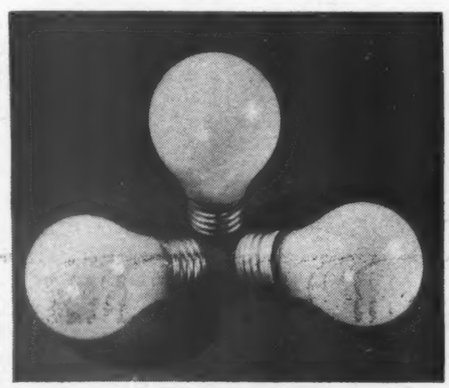
Both the frame and blade are of all-welded steel, one-piece construction. Because the knife adjustment is made by movement of the upper blade, there is no need of moving the bed as is customary with most shears. Consequently, the beds on Steelweld Shears are welded integral with the frames and the large crown is welded to both end housings.

Other features include heavy spring-operated mechanical hold-downs which hold the plates firmly during shearing and automatically clamp thick plates with higher pressure than thin plates. A back gauge is mounted on ball bearings, the operating crank and dials of the gauge being conveniently located at the outside front corner of the shear, readily accessible to the operator. The shear angle or rake is unusually low, thereby minimizing end thrust on the plate and reducing twist, camber and bow in the cut pieces.

Steelweld Shears have been developed in various sizes for cutting plate of all thicknesses from 12 gauge to 1¼ in. and for lengths from 6 ft. to 16 ft. Speeds range from 60 strokes per minute on the smaller shears to 25 strokes per minute on the largest size.

Low-Voltage Incandescent Lamps

Low-voltage, inside-frosted lamps in standard sizes with medium bases and rated at 1,000 hours life are now being supplied by Sylvania Electric Products, Inc., Salem, Mass. Six- and twelve-volt lamps in 15-, 25- and 50-watt sizes are designed especially for battery-generator sets and portable battery-operated lighting. The 30-volt lamps in 15-, 25-, 50- and 100-watt sizes are designed for use on railway passenger cars and tug and work boats, and other battery-generator circuits, having voltages between 28 and 32 volts. Used with standard extension cords, the lamps make a



The lamps are made with standard Edison bases for 6-, 12- and 30-volt service in sizes ranging from 15 to 100 watts

rugged trouble light which may be operated from a low-voltage transformer or battery.

Engine-Driven Battery Charger

A portable engine-driven generator for yard and terminal charging of passenger car batteries is now being supplied to railroads by D. W. Onan & Sons, 43 Royalston, No., Minneapolis, Minn.

The engine which is water-cooled is rated 7.5 hp. at 2,000 r.p.m. It is a 4-cycle, vertical two cylinder, L-head engine with 3-in. bore and 2¾-in. stroke. Main and connecting rod bearings are pressure lubri-

cated, and other internal parts are spray lubricated.

Equipment includes the 5-gal. fuel tank, horizontal draft carburetor, fuel filter, oil

One of the charging units in service

type air cleaner, automatic choke, and magneto ignition. The engine is cranked by the generator with current from the 32-volt car batteries. Speed is governed by a mechanical, centrifugal weight type governor.

The generator is a 4-pole, shunt-wound, commutating pole type machine designed for inherent regulation. It is air-cooled by a flywheel blower. The frame is constructed of machined rolled steel. Class "A" insulation is used throughout. Brushes are metal graphite, and brush-rig position is adjustable. An oversize ball bearing is used at the outboard end of the armature shaft. The generator rating is 3,500 watts, at 32 to 50 volts d.c.

The control panel includes a voltmeter, an ammeter, a field rheostat, start and stop buttons, a manual reset circuit breaker, and a 32-volt panel lamp with toggle switch.

The entire unit is mounted in a steel housing on a rubber-tired dolly. The complete unit is 62 in. long, 35 in. wide, 40½ in. high, and weighs 656 lb.

Alloy Steel

The Alan Wood Steel Company, Conshohocken, Pa., announces a low-alloy, high-tensile steel known as Dynalloy. It was developed for use in the transportation field to meet the requirements for lightweight construction of railroad rolling stock, and trucks and buses. Dynalloy is suited for use wherever corrosive action must be avoided.

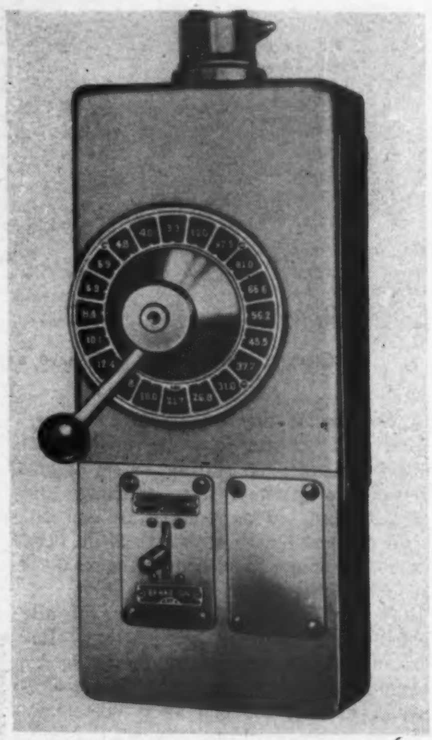
The alloy steel has the following average chemical composition: Carbon .12, manganese .75, phosphorus .080, sulphur .035, nickel .70, and molybdenum .07 per cent. The elastic limit is 50,000 lb. per sq. in.

Pendant Control

The Bullard Company, Bridgeport 2, Conn., has developed a dial type of pendant control for its line of Cut Master vertical turret lathes. A swinging arm carrying the pendant is mounted on top of the machine high enough to permit full clearance of vertical heads when they are at the highest position. The arm may be swung from the right side of the machine to any convenient point at the left side of the machine.

The design is a departure from conventional controls of this type because the speeds are selected by means of dialing. When the machine is in operation and a speed change is desired, the switch lever is thrown into brake position, the change of speed dialed and the lever thrown back into clutch position. Gears are shifted through an electrically controlled, hydraulically operated mechanism.

There are many situations which require



Dial-type pendant control for Bullard Cut Master vertical turret lathes

jogging of the table for positioning and indicating purposes. This operation is accomplished through the use of the switch lever which will jog and position the table for any fraction of a revolution.

Diesel-Engine Wear Detection

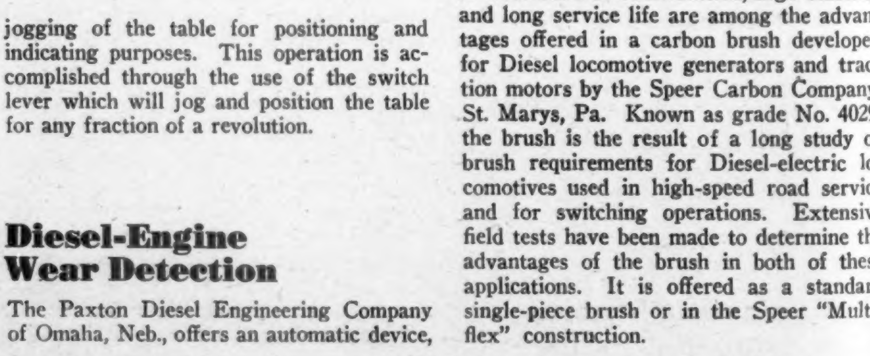
The Paxton Diesel Engineering Company of Omaha, Neb., offers an automatic device, known as the Bearing Watchdog System, to detect the wear beyond predetermined limits or shell-out of connecting rod and main bearings of a Diesel engine. A "watchdog" or trip lever installed in the crankcase under each connecting rod and a lug on each connecting-rod bearing cap are the points of contact which set the system into action. Other units of the system include a dump valve to be attached to the Serv-O-Motor of any standard hydraulic governor and a control box containing an air-pressure reducing valve and a tell-tale light. Copper tubing connects the various parts.

The system can be operated either pneumatically or hydraulically. Under pneumatic operation, it is connected to the engine's main air supply, and a constant pressure of 10 lb. is normally maintained. No electrical circuits enter the crankcase.

Allowing for the expansion and flexing in the engine, the clearance between the trip lever and the lug is set equal to the maximum amount of permissible wear. If a connecting-rod bearing or main bearing wears excessively or shells out, the lug strikes and trips the lever. This releases the pressure from the system and activates the dump valve on the governor. The latter effects an immediate engine shutdown and the simultaneous lighting of the tell-tale light. Protection is also afforded if a main bearing goes out, because the crankshaft will flex sufficiently to trip the lever. The engine is protected in the case of broken connecting-rod caps, broken cap bolts or connecting rods because anything that releases the air pressure from the system causes an engine shutdown.

Carbon Brush For Diesel Locomotives

A wide band of commutation, high stability and long service life are among the advantages offered in a carbon brush developed for Diesel locomotive generators and traction motors by the Speer Carbon Company, St. Marys, Pa. Known as grade No. 4029, the brush is the result of a long study of brush requirements for Diesel-electric locomotives used in high-speed road service and for switching operations. Extensive field tests have been made to determine the advantages of the brush in both of these applications. It is offered as a standard single-piece brush or in the Speer "Multiflex" construction.



Automatic system for detecting wear of Diesel engine bearings

NEWS

Co-ordinated Mechanical Meetings Next Fall

AT a committee meeting of the Co-ordinated Mechanical Associations in Chicago on January 22, preliminary general arrangements were made for the resumption of annual meetings of the four associations making up the co-ordinated group at the Hotel Sherman, Chicago, September 4 to 6, inclusive. These associations include the Railway Fuel and Traveling Engineers' Association, Car Department Officers' Association, Locomotive Maintenance Officers' Association and Master Boiler Makers' Association.

The opening joint session of these four associations on the morning of September 4 will be addressed by a prominent railroad president after which the individual groups will adjourn and reconvene in their respective meeting rooms to consider programs covering in the aggregate nearly every important current problem in locomotive and car operation and maintenance. The four programs have been carefully co-ordinated to avoid duplication of subjects and schedule these subjects so as to enable railway officers especially interested in a particular one to hear it and participate in the discussion regardless of which association is presenting it.

An extensive exhibition of railway equipment specialties, materials and shop tools is planned and will be held under the auspices of the Allied Railway Supply Association.

A. S. M. E. Railroad Division to Meet at Chattanooga

IN connection with the spring meeting of the American Society of Mechanical Engineers, scheduled to be held at the Hotel Patten, Chattanooga, Tenn., April 1 to 3, the Railroad Division plans to sponsor a technical session or symposium on welded locomotive boilers. The morning of April 2 will be devoted to an inspection trip to the plant of the Combustion Engineering Company at Chattanooga where the original Delaware & Hudson welded locomotive boiler was stress relieved. At 2:00 p. m. on April 2, Railroad Division members will reconvene at the hotel where the principal paper, "The Welded Locomotive Boiler," will be presented by James Partington, manager, Engineering Department, American Locomotive Company.

Supplementary papers or discussions will include "Service Performance and Maintenance of the Welded Locomotive Boiler," by G. S. Edmonds, superintendent motive power, Delaware & Hudson; "Fabrication and Heat Treatment of the Welded Locomotive Boiler," by A. J. Moses, vice-president and general manager, Chattanooga plant, Combustion Engineering Company; "Remarks on Developments in the Use and Prospective Use of Fusion-Welded Locomotive Boilers," by John M. Hall, director, Bureau of Locomotive Inspection, Interstate Commerce Commission.

F. C. C. and I. C. C. Agree on Train Radio Control

THE Federal Communications Commission favors legislation giving the Interstate Commerce Commission regulatory control over railroad train-communication systems, provided it is made clear that installations involving radio must be made in accordance with the permit and license requirements of the Communications Act of 1934 and rules and regulations issued pursuant thereto by F. C. C. This was revealed in a recent letter wherein F. C. C. Chairman Paul A. Porter gave Chairman Wheeler of the Senate committee on interstate commerce F. C. C.'s views on S. 1537, the bill sponsored by Mr. Wheeler to give the

Orders and Inquiries for New Equipment Placed Since the Closing of the February Issue

LOCOMOTIVE ORDERS

Road	No. of locos.	Type of loco.	Builder
Erie	7[1]	4,500-hp. Diesel-elec.	Electro-Motive
Pennsylvania	1[2]	6,000-hp. Diesel-elec.	Baldwin Loco. Works

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Columbus & Greenville	50	50-ton flat-bottom gondolas	American Car & Fdry.
Godfrey L. Cabot, Inc.	20	50-ton covered hoppers	American Car & Fdry.
Gulf, Mobile & Ohio	50	70-ton covered hoppers	American Car & Fdry.
Wheeling & Lake Erie	750	60-ton hopper	American Car & Fdry.

FREIGHT-CAR INQUIRIES

Road	No. of cars	Type of car	Builder
Ann Arbor	50	50-ton box	

PASSENGER-CAR ORDERS

Road	No. of cars	Type of car	Builder
Pennsylvania[3]	22	Sleeping	American Car & Fdry.
	5	Twin-unit dining	American Car & Fdry.
	21	Coaches	American Car & Fdry.
	4	Bagg.-dormitory	American Car & Fdry.
	50	Sleepers	Edw. G. Budd
	6	Kitchen-dormitory	Edw. G. Budd
	3	Twin-unit dining	Edw. G. Budd
	6	Diners	Edw. G. Budd
	2	Coach-lounge	Edw. G. Budd
	87		Pullman-Standard

PASSENGER-CAR INQUIRIES

Road	No. of cars	Type of car	Builder
Erie	7[1]	Sleeping	

[1] For delivery late this year. The Erie also is remodeling and modernizing the interior of 15 through-line coaches to be used with the new locomotives. The exterior color arrangement will harmonize in appearance with the Diesels. This equipment and the seven new sleeping cars for which bids have already been closed, will be used on passenger trains operating between Jersey City, N. J., and Chicago. The sleeping cars will have six bedrooms and ten roomettes each.

[2] The new locomotive, which is to be operated in non-electrified territory with high-speed trains, both passenger and freight, will consist of two 3,000-hp. units, coupled together, with control cabs at each end. Each unit will be equipped with running gear similar in design to that of the Pennsylvania's type GG-1 electric passenger locomotives, except that there will be eight pairs of driving wheels instead of six.

[3] The orders for the new passenger cars will total $21,000,000 and deliveries will begin late this year. The order to American Car & Foundry comprises 7 cars having 21 roomettes; 15 cars each consisting of four compartments, four double bedrooms and two drawing rooms; 5 twin-unit diners; 21 coaches and 4 baggage-dormitory cars. The Budd equipment comprises 50 sleepers, each with 21 private rooms for single occupancy; 6 kitchen-dormitory cars; 3 twin-unit diners (totaling 6 cars); 6 regular diners, each with a capacity of 48 passengers and kitchen, and 2 coach-lounge cars. The 70 cars will cost in excess of $7,000,000. The Pennsylvania has also announced the purchase from the Pullman Company of 142 light-weight sleeping cars and 123 parlor cars. These cars have been in use on the Pennsylvania for some time and are regularly assigned to its service.

NOTES:

The CHICAGO, INDIANAPOLIS & LOUISVILLE has received authorization from Federal Judge Michael L. Igoe at Chicago to spend $5,500,000 for new equipment which is to include 14 Diesel-electric freight locomotives and three modern trains of five cars each.

The PACIFIC FRUIT EXPRESS (owned jointly by the Union Pacific and the Southern Pacific) has been authorized by the parent companies to purchase 2,000 standard-type refrigerator cars at an approximate cost of $12,000,000.

The MISSOURI PACIFIC has completed plans to order a number of the General Motors-designed and Budd-built "Astra Dome" cars, one of which was successfully tried out by the Chicago, Burlington & Quincy as a revolutionary change in railroad car design due to its upper deck, which affords passengers a completely unobstructed view in all directions. The dome-constructed roof will be built into three of six lightweight cars now on order for the road's Missouri River Eagle. Each dome, made entirely of glass, will contain 12 elevated seats on each side which can be reached by a short stairway from the coach floor level.

The SOUTHERN PACIFIC has completed plans for the construction of two new de luxe Diesel-electric powered daylight streamline trains which will be placed in operation between San Francisco, Calif., and Portland, Ore. The trains, to be known as the "Shasta Daylights," will each consist of 14 cars, powered by Diesel-electric locomotives, and besides the coaches will include baggage car, diner, kitchen car, coffee shop, tavern car and observation-parlor car. The diner-kitchen-coffee shop will form a three-car unit, with the kitchen in the center. An important innovation will be the installation of a new type of window which will afford passengers a wide-angle view, vertically as well as horizontally. The Southern Pacific also plans a number of important improvements in its "Cascades" sleeping trains.

I. C. C. regulatory control over train communications, including power to require railroads to install telegraph, telephone, radio, inductive, or other systems.

Enactment of the proposed legislation, Mr. Porter said, is recommended by F. C. C. "first, because it disposes of any question of the authority of the Interstate Commerce Commission to order the installation of such systems pursuant to section 25 of the Interstate Commerce Act, and, secondly, because the bill would delegate to the experienced railroad regulating agency, the Interstate Commerce Commission, the responsibility for determining the manner and extent to which train radio communications systems may be installed and operated (in supplementation of or in substitution for existing signaling devices) or discontinued."

Previously Mr. Porter had outlined F. C. C. activities in the field of railroad radio, noting these activities culminated recently in the adoption of rules for the establishment of railroad radio service. "Now that railroad radio service will shortly be in operation on a regular, non-experimental basis as far as this commission is concerned, it is appropriate to require the railroads to use radio or inductive communication systems if found necessary in the public interest," Mr. Porter added.

In order to eliminate any possibility that the I. C. C. might impose upon a railroad radio specifications at variance with F. C. C. rules, and to remove any suggestion that an F. C. C. license would not be required for an installation ordered by the I. C. C., Mr. Porter would add to the bill's paragraph (b) the following additional proviso:

And provided further, That the installation and operation of any train communication system or portion thereof employing radio for the transmission of energy or communications or signals and requiring a radio station permit or license under the provisions of the Communications Act of 1934, as amended, shall be effected in accordance with the provisions of that act and such applicable rules and regulations as may be issued pursuant thereto by the Federal Communications Commission.

Electrical Men to Meet at Chicago in October

THE Electrical Section, Mechanical Division, Association of American Railroads, has arranged to hold a three-day meeting in Chicago, October 22-24. The Railway Electric Supply Manufacturers Association will hold a meeting at the same time. The question of exhibits has not as yet been decided by the Manufacturers Association, but the General Committee of the Mechanical Division, A. A. R., has sanctioned the holding of the exposition.

1945 Equipment Installations

CLASS I railroads put 38,987 freight cars and 643 locomotives in service in 1945, according to the Association of American Railroads. This was a decrease of 1,405 cars and a decrease of 295 locomotives compared with the number installed in 1944. In 1943 the railroads put in service 28,708 new freight cars and 773 new locomotives.

Of the new freight cars installed in the past calendar year, there were 18,977 plain box, 2,134 automobile, 5,971 gondolas, 8,489 hopper, 1,218 flat, 1,860 refrigerator, 239 stock cars, and 99 miscellaneous cars. The new locomotives installed in 1945 included 109 steam and 534 Diesel-electric, compared with 329 steam, one electric and 608 Diesel-electric in 1944.

Class I roads on January 1 had 37,160 new freight cars on order. On the same date last year they had 36,597 on order. This year's January 1 total included 13,566 plain box, 3,653 automobile box, 4,391 gondolas, 13,997 hoppers, which included 3,201 covered hoppers, 735 refrigerator, and 100 miscellaneous cars.

Railroads also had 471 locomotives on order on January 1, which included 92 steam, six electric, and 373 Diesel-electric locomotives. On January 1, 1945, they had 468 locomotives on order which included 66 steam, two electric and 400 Diesel-electric.

Felton Becomes President of Car Institute

SAMUEL M. FELTON, for the past nine years general sales manager of the railway division of the Edward G. Budd Manufacturing Company, has been elected full-time president of the American Railway Car Institute. This formerly was an honorary position held by the presidents of various car-building companies. The organization, nationwide in its membership, includes the leading builders of both passenger and freight cars. Mr. Felton is a graduate of Harvard University (1916). He was a major in the engineering corps in the first world war, serving as executive officer to the chief engineer of the American Expeditionary Forces. He was decorated both by the United States and France.

Samuel M. Felton

Locomotive Inspection Rules Amended

THE Interstate Commerce Commission has further amended its rules and instructions for the inspection and testing of steam locomotives and tenders, by order of Commissioner Patterson issued January 16. These amendments deal with the provision of emergency brake valves at the front of the tender or back cab wall, the provision of cab devices indicating the quantity of water in tender tanks, and arrangements for auxiliary operation of air-operated power reverse gears.

Eksergian Becomes Franklin Institute Consultant

DR. RUPEN EKSERGIAN, chief consulting engineer of the Edward G. Budd Manufacturing Company, has been named also senior consultant to the executive director of the Franklin Institute Laboratories (for industrial research) at Philadelphia, Pa. George S. Hoell, formerly machine designer for the Budd Company, has been named director of the Franklin Institute's division of mechanical engineering.

Welding Replaces Riveting on New C. P. R. Boiler

THE first Canadian locomotive to be equipped with an all-welded boiler instead of the standard riveted construction was delivered to the Canadian Pacific by the Montreal Locomotive Works last week. The new engine, No. 1216, will complete its 1,000-mile test running between Montreal and Smith's Falls before going to the company's lines in Western Canada. One more engine of the same class, designed for postwar replacement of older motive power, also will be equipped with the new boiler and will be operated in Eastern Canada.

Bureau of Safety 1945 Fiscal Review

A FURTHER substantial increase over 1944 and previous years in the number of instances where railroads reported employees working excess hours of service was noted in the annual report for the fiscal year ended June 30, 1945, of S. N. Mills, director of the Bureau of Safety of the Interstate Commerce Commission. The 36-page document sets forth in the usual form the results of inspection of safety-appliance equipment on railroads together with information on hours of service records of employees, installations of signaling facilities, investigations of accidents, and other activities of the bureau.

During the fiscal year, according to the report, a total of 1,462,186 cars and locomotives were inspected, and 46,662 or 3.19 per cent were found defective. This is the highest percentage of defective equipment noted during the 1936-1945 decade, exceeding 1944's 3.03 per cent. The percentage for 1942 was 2.82 and the low for the 10-year period was 2.31 per cent in 1937. Included in the rolling stock inspected in 1945 were 30,198 passenger-train cars, of which 950 or 3.15 per cent were reported with defective safety appliances, with 1,269 defects noted.

Air-brake tests were made on 3,457 trains, consisting of 151,185 cars, prepared for departure from terminals, and air brakes were found operative on 151,041, or 99.9 per cent of these cars. This percentage was attained, however, the report noted, after 1,851 cars having defective brakes

were set out and repairs had been made to the brakes on 1,684 cars remaining in the trains. As in previous years, the bureau comments as follows: "These trains had been prepared for departure; yet when afterward tested by our inspectors it was necessary to set out or to repair the brakes on an average of one car per train."

Similar tests on 1,836 trains arriving at terminals with 97,356 cars showed that the air brakes were operative on 95,388 cars, or 98.0 per cent of the total. Cars with inoperative brakes averaged about one per train, the average consist per train arriving being 53.0 cars.

Commenting on the program for equipping cars with AB brakes, the report notes that the year brought an increase of 180,038 in the number of cars thus fitted—55,859 of them being new cars. It emphasizes that during the 10-year period allotted for making this improvement, which expired January 1, 1945, only 53.4 per cent of the freight cars in interchange service have been equipped with the present standard air-brake apparatus. Adopting substantially the same specifications, the commission required brake installations in conformity on all cars used in freight service, except those equipped with passenger-car brakes, in its order of May 30, 1945, and the report remarks that a show-cause order had been served on the railroads before the end of fiscal 1945, requiring information as a basis for prescribing the time within which that installation must be completed.

The bureau has continued its cooperation with the Association of American Railroads with respect to tests of geared hand brakes. No change from the previous year was reported as to types of vertical-wheel geared brakes that have been certified as conforming to A. A. R. requirements, the number remaining 12, but it was noted that two types of horizontal-wheel geared brakes have been certified and final action is pending on others.

During the year, the plans and specifications of 10 safety devices were examined, and opinions thereon were transmitted to the proprietors or their agents. "These devices," the report explained, "included one safety guard for car wheels, one automatic safety lighting system, one interlocking rail, one tie plate, one rail-joint splicing and supporting plate, two devices for detection of hot journals, one automatic train-control device, one device for closing angle cock, and one device for uncoupling tender of derailed engine from first car."

Supply Trade Notes

Dearborn Chemical Company.—*John F. Wilkes* has been appointed technical director of the Dearborn Chemical Company's railroad department in Chicago. Mr. Wilkes, who returns to Dearborn after four years' service with the Army Signal Corps, is a graduate in chemical engineer-

J. F. Wilkes

ing of the University of Florida (1933) where he was a Cadet Lieutenant Colonel of ROTC and honor military graduate. He became laboratory assistant in the water supply department of the Chesapeake & Ohio in January, 1934, and later served as assistant chemist and chemist in the Huntington laboratory. He joined the Dearborn Chemical Company in 1939 as chemical engineer at Atlanta, Ga. Mr. Wilkes was called to active duty with the Signal Corps in 1943 as a first lieutenant. He was assigned to the Army Electronics Training Center, Harvard and M. I. T., at Cambridge, Mass., where he served as laboratory supervisor and instructor in electronic communications. At the M. I. T. Radar School he trained Army and Navy officers in the theory and operation of micro-wave radar equipment. He was transferred to the Engineering and Technical Service office of the Chief Signal Officer in Washington, D. C., in 1944. As Chief of the Maintenance Planning Branch he developed plans for the maintenance and repair of complex communications and radar equipment and supervised field maintenance operations. On VE Day, 1945, he was promoted to the rank of major and assigned as assistant director of the Technical Coordination Division, which post he held until his release from active service.

◆

Templeton, Kenly & Co.—*Eugene T. Scott* has been appointed product application engineer with headquarters in Chicago for Templeton, Kenly & Co., Chicago. Mr. Scott had been in the navy since 1942.

◆

Chambersburg Engineering Company.—*Frank G. Shaub* has been appointed Detroit representative of the Chambersburg

F. G. Shaub

Engineering Company at 14456 Scripps avenue, Detroit 15, Mich. Mr. Shaub had previously been with the Ford Company, specializing in the maintenance of steel mill and forging equipment and forging die development.

Philaelphia Steel & Wire Corporation.—*Frank J. Meyer* has been appointed chief engineer, railway division, of the Philadelphia Steel & Wire Corporation. Mr. Meyer, who recently resigned as chief engineer of the New York, Ontario & Western, has been associated with railroads during his entire business career in engineering and maintenance positions. In his new position he will follow up the use of the

Frank J. Meyer

Philadelphia Steel & Wire products with the engineering, maintenance, motive-power, mechanical and signal departments in territories presently served by that company, and will endeavor to develop new fields.

◆

Paxton-Mitchell Company.—*James J. Keliher*, assistant to the president and chief service engineer of the Paxton-Mitchell Company of Omaha, Neb., has retired. *James C. Peugh* has been appointed sales and service engineer to cover the western part of the United States, the territory formerly handled by Mr. Keliher. Mr. Peugh once was connected with the Missouri Pacific. He has been serving in the army for the past thirty-nine months.

Menasco Manufacturing Company.—District representatives in New England, New York, Pennsylvania, West Virginia and Ohio territories have been appointed to handle Malabar specialized lifting equipment for railroads. Malabar is a product division of the Menasco Manufacturing Company. The appointments are the *Walton R. Collins Company* of New York to cover the New York area; *E. Loyd Ettenger*, Washington, D. C., for the middle Atlantic territory; and *W. J. Church*, New Orleans, La., for the Western Texas and Louisiana territories.

◆

American Brake Shoe Company.—The American Brake Shoe Company has purchased Joliette Steel, Ltd., producer of manganese and alloy-steel castings in Canada. The company will be operated by the present management, working under the direction of Brake Shoe's American Manganese Steel division. *Joseph B. Terbell* will head the company and *J. L. Mullin* will be a vice-president. An expansion and mechanization program has been planned for Joliette Steel under which production will be increased and a wider range of alloy-steel products produced.

Frank H. Janke, assistant to the president of the American Brake Shoe Company, retired from active service on January 1.

The National bearing division of the American Brake Shoe Company has moved its Pittsburgh, Pa., sales office to the Grant Building, room 1110.

◆

General Electric Company.—*Wayne E. Lynch*, a member of the Transportation division of the General Electric Company at Chicago, has been promoted to sales engineer of the division, with the same headquarters, succeeding *Carlos Dorticos*, who has retired after 42 years of service with the company.

◆

Continental Oil Company.—*L. D. Yenawine* has been appointed lubrication engineer in the railway sales division of the Continental Oil Company with headquarters in St. Louis, Mo. Mr. Yenawine formerly was employed with the Terminal R. R. Association of St. Louis, where he served as steam foreman and later as Diesel foreman.

◆

J. B. Kintner Company.—*J. B. Kintner* has resigned as vice-president of the Union Steel Castings division of the Blaw-Knox Company to establish his own company, the J. B. Kintner Company, a manufacturers' agency, in Pittsburgh, Pa. The new agency's clients include the Pittsburgh Steel Foundry Corporation and the Fort Pitt Steel Castings Company.

◆

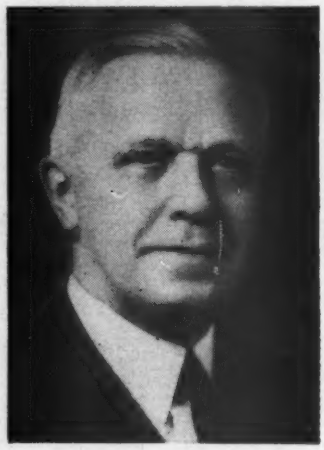
Scullin Steel Company.—*W. A. Gray, Jr.*, has been appointed sales representative for the Scullin Steel Company, with headquarters in St. Louis, Mo.

◆

Maxim Silencer Company.—The Maxim Silencer Company of Hartford, Conn., has announced that it will handle all business in Vermont, New Hampshire, Maine, Massachusetts and Rhode Island direct from its main office in Hartford.

American Arch Company.—*Alfred H. Willett* has been elected vice-president in charge of engineering of the American Arch Company, New York, to succeed *John P. Neff*, who has retired after 32 years in the post. *Thomas Mahar*, manager of the company's service department, also has retired.

Alfred H. Willett was born in England in 1885. Coming to America as a boy, he was educated in the Chicago public schools and at the Armour Institute, Chicago. He entered the railway supply business in 1908 in the engineering department of the American Locomotive Equipment Company at Chicago, and two years later joined American Arch as chief draftsman. He had been mechanical engineer of the company since 1926.



Alfred H. Willett

John P. Neff is a graduate of Purdue University (1895) with a degree in mechanical engineering. Upon graduation he went to work for the Chicago & North Western, and in 1902 was appointed master mechanic of the road's western Iowa division. He joined the American Locomotive Equipment Company, Chicago, in 1904 and six years later became associated with the American Arch Company. During the next five years he was engineer of tests and mechanical engineer. He was elected vice-president in charge of engineering in 1913.

John P. Neff

Thomas Mahar had been with the company since 1912, first as a service engineer. He entered railroad service in 1891 as a machinist apprentice in the employ of the Rome, Watertown & Ogdensburg, now a part of the New York Central system. In 1904 he was in charge of the New York Central exhibit at the St. Louis, Mo., exposition, and later served successively on that railroad as assistant superintendent of tools and machinery; enginehouse foreman at the Chatham, N. Y., shops; general foreman at Mott Haven, N. Y.; general foreman at High Bridge, N. Y.; terminal master mechanic at Albany, N. Y., and master mechanic at New York.

Thomas Mahar

◆

United States Steel Supply Company.—*Frederick J. Bruckner*, manager of the stainless steel, alloy and aircraft steels division of the United States Steel Supply Company (a subsidiary of the United States Steel Corporation) has been promoted to assistant manager of sales for the Chicago district, with headquarters at Chicago.

◆

Giddings & Lewis Machine Tool Company.—The Giddings & Lewis Machine Tool Company, Fond du Lac, Wis., has acquired the Davis Boring Tool division of the Larkin Packer Company of St. Louis, Mo. Standard and special boring bars and cutters formerly manufactured in St. Louis, are now manufactured in the Giddings & Lewis plant at Fond du Lac.

◆

Standard Brake Shoe & Foundry Company.—*A. C. Griffith* has been appointed sales manager of the Standard Brake Shoe & Foundry Company, with headquarters in the general offices at Pine Bluff, Ark.

◆

Clark Equipment Company.—*Maxwell A. Goodwin* has returned to his prewar position as manager of the Chicago office of Clark Tructractor, a division of the Clark Equipment Company. Mr. Goodwin was called to Washington in July, 1942, to supervise distribution of industrial power trucks for the Army and Army Air forces. He was commissioned a captain in October, 1942, and promoted to major in November, 1943. He served as chief of the material handling equipment section of the Storage division, Headquarters, Army Service Forces.

AMERICAN WELDING & MANUFACTURING COMPANY.—*Henry H. Knapp* has been appointed service engineer of the American Welding & Manufacturing Company, Warren, Ohio. Initially, Mr. Knapp will follow the work of the engineering staff of the division in the design and development of a number of products being readied for car and locomotive application. Later he will be available for field consultation on the installation of these devices, which include the Amweld front end and Amweld dust guards. A native of New York City, Mr. Knapp attended the Mechanics' Institute and Columbia University, and in 1927 joined the Equipment Engineering Division of the New York Central Railroad. From 1941 until the time of joining American Welding, Mr. Knapp was system-wide special representative for the prevention of damage to car lading.

◆

HEINTZ MANUFACTURING COMPANY.—*Weber de Vore,* who throughout the war years was manager of the ordnance division of the Heintz Manufacturing Company, Philadelphia, Pa., has been appointed to head that company's newly organized marine, railroad and export division. *Evan J. McCorkle* has been appointed assistant to Mr. de Vore. *Paul R. Higginbotham,* formerly in charge of Navy sales work at Heintz, has been transferred to the company's refrigeration and air-conditioning division.

◆

CHICAGO MALLEABLE CASTING COMPANY.—*John T. Llewellyn,* whose election to chairman of the board of directors of the Chicago Malleable Castings Company, Chicago, was reported in the February issue,

John T. Llewellyn

was born at Briton Ferry, South Wales, Great Britain, on July 7, 1863. He began his business career in 1879 as a sales agent at the Milwaukee (Wis.) works of the North Chicago Rolling Mill Company. From 1895 to 1899 he was president of the Belle City Malleable Iron Company, with headquarters at Racine, Wis. In the latter year he organized the Chicago Malleable Castings Company, of which he became president in 1928. Mr. Llewellyn also founded the Allied Steel Castings Company, Harvey, Ill., in 1918, and has been president of that organization since that time. He is also a director of the Interstate Iron & Steel Co.

W. L. Beaudway, whose election to president of the Chicago Malleable Castings Company, Chicago, was reported in the February issue, was born at South Bend, Ind., on August 30, 1884. He began his

W. L. Beaudway

business career as an office boy in the employ of the Studebaker Corporation in 1898. Later he was assigned to the stores department where he held various positions until his promotion to the position of general storekeeper in charge of all stores at South Bend and Detroit, Mich. In 1918 Mr. Beaudway resigned to become assistant works manager of the Chicago Malleable Castings Company. He subsequently served as works manager, general manager, treasurer, vice-president and executive vice-president. Mr. Beaudway is also executive vice-president and a director of the Allied Steel Castings Company, a subsidiary of Chicago Malleable.

◆

JOYCE-CRIDLAND COMPANY. — *Huston Brown,* vice-president, has been elected president of the Joyce-Cridland Company, of Dayton, Ohio, to succeed *J. M. Switzer,* who becomes chairman of the board. *Kert Hott,* chief engineer, has been elected vice-president and secretary, and *Warren Webster,* secretary, has been elected vice-president and treasurer. *Merle P. Smith,* who recently returned from service in the Army with the rank of lieutenant colonel, has been appointed general manager. Mr. Brown will continue as director of sales.

◆

DAYTON MANUACTURING COMPANY.—*Bert R. Prall,* former vice-president and general manager of operations and a member of the board of Montgomery Ward & Co., Chicago, has been elected executive vice-president of the Dayton Rubber Manufacturing Company. Mr. Prall was associated with Montgomery Ward for the past 26 years. The office of chairman of the board of Dayton Rubber was left vacant, and will continue to be combined with the office of Mr. Freedlander, president, who is chief executive officer and general manager of the company.

◆

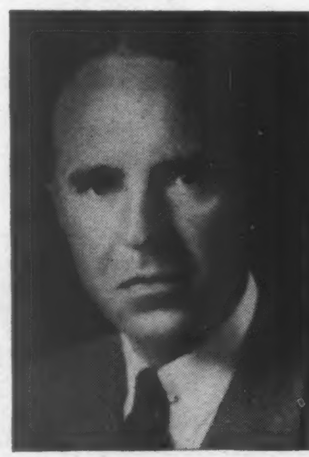
PARKER APPLIANCE COMPANY. — The Parker Appliance Company, Cleveland, Ohio, has announced the appointment of a number of manufacturers' supply firms as distributors of Parker industrial fittings and tube bending equipment. The distributors are: the Whitehead Metal Products Company, New York, Boston, Mass., Buffalo, N. Y., Newark, N. J., and Philadelphia, Pa.; Williams & Co., Pittsburgh, Pa., Cleveland and Cincinnati, Ohio; the A. E. Borden Company, Boston; the Carey Machine & Supply Co., Baltimore, Md.; the Louis H. Hein Company, Ardmore, Pa.; Squirer-Schilling & Skiff, Newark; Somers-Fitler & Todd, Pittsburgh; the W. M. Pattison Supply Company and Strong-Carlisle & Hammond, Cleveland; the Great Lakes Supply, Chicago; the Vincent Brass & Copper Co., Minneapolis, Minn.; the Metal Goods Corporation, St. Louis, Mo., Tulsa, Okla., Dallas and Houston, Texas; General Machinery & Supply and the American Brass & Copper Co., San Francisco, Calif.; the Metropolitan Supply Company, Los Angeles, Calif.; and the Eagle Metals

◆

FORMICA INSULATION COMPANY.—*Fred C. Walter,* who has been associated with the sales, advertising and product development department of the Formica Insulation Company for 17 years, has been appointed assistant sales manager. *Albert Lesberil* has been appointed manager of a direct factory branch office opened by the company in Philadelphia, Pa. The Philadelphia territory formerly had been operated under Mr. Lesberil as a branch of the New York office. The company's Atlanta, Ga., and Charlotte, N. C., territories have been combined with offices in both cities. *Clarence Kuester,* who has been associated with his brother, Fason Kuester, in charge of the Charlotte office, has been transferred to Atlanta in charge of the sales work in the Georgia area. *Kenneth Pitt,* until recently in the Formica home office and plant purchasing department, has been transferred to Boston, Mass.

◆

NATIONAL MALLEABLE & STEEL CASTINGS COMPANY.—*Ellsworth H. Sherwood* has been appointed New York and New England district manager for the National Malleable & Steel Castings Company's rail-



Ellsworth H. Sherwood

way sales division, with offices in New York, to succeed *Charles Gaspar,* who is retiring after thirty years of service with the company. Mr. Sherwood, who joined National Malleable in 1920 after attending Michigan University, has been closely identified with sales and development of the company's spun-steel car-wheel business. He will continue in an advisory capacity

in wheel promotion in addition to his new duties as district sales manager. *Floyd Snyder,* who has been continuously associated with the New York sales office since 1911, except for service in the Navy during the first World War, has been appointed sales agent at the New York office. *George F. Wilhelmy,* who joined National Malleable in 1905, has been appointed sales agent in the railway division's Cleveland, Ohio, office.

◆

GRIFFIN WHEEL COMPANY. — *Herbert J. Rosen,* vice-president of the Griffin Wheel Company at Chicago, has been elected executive vice-president, with the same headquarters. Mr. Rosen was born at Brooklyn, N. Y., on February 12, 1885. His entire business career has been spent with the Griffin organization with which he started on July 2, 1900, as a clerk of the plant office at Denver, Colo. After holding various office positions, he served as cashier at Chicago, Detroit, Mich., and Denver, during the period from 1906 to 1914. In the latter year he became assistant to the chief engineer, and in 1918 was appointed assistant superintendent of the order division. Later in 1918 Mr. Rosen became sales agent at Denver. In 1930 he was appointed assistant to the vice-president, and in 1934 operating manager. In January, 1944, he was elected vice-president.

Herbert J. Rosen

◆

AIREON MANUFACTURING CORPORATION.—*Arthur E. Welch* has been elected to the newly created office of vice-president in charge of sales of the Aireon Manufacturing Corporation. Mr. Welch formerly was vice-president and treasurer.

◆

HEYWOOD-WAKEFIELD COMPANY. — Heywood-Wakefield's transportation seating division has announced that *J. C. Kettlesen,* of the Gulf States Equipment Company, will sell Heywood-Wakefield railroad and bus seats in the southwestern United States. The offices of the Gulf States Equipment Company are in Dallas, Texas.

◆

AMERICAN LOCOMOTIVE COMPANY.—*Roland A. Sherwood* has been appointed assistant to the president of the American Locomotive Company with headquarters in New York. Mr. Sherwood is a graduate of Columbia University. He joined the company in 1930 and became assistant to the executive vice-president last September

R. A. Sherwood

◆

AMERICAN CAR AND FOUNDRY COMPANY. —*D. P. Samson* has been appointed manager of foundry sales of the American Car and Foundry Company and will be in charge of sales of chilled tread wheels, wheel tread grinders and other foundry products. His headquarters will be in New York. Mr. Samson was born in Rochester, N. Y. He attended the University of Pennsylvania, Class of 1913, first specializing in the field of architecture and later completing his studies at the Wharton School of Finance. From 1914 to 1917 he worked in the experimental laboratory of the Metal Plating Company, Elizabeth, N. J., and during World War I was employed as a tool designer for the Duesenberg Motors Company which was then engaged extensively in war work. He came to the American Car and Foundry Company in May, 1919, and was employed in the purchasing department until January, 1930, when he was transferred to the sales division to do special work associated with ballast and hopper cars. From 1930 until the present time Mr. Samson has been engaged in the handling of miscellaneous products such as forgings, castings, etc.

D. P. Samson

◆

BOWSER, INC. — Bowser, Inc., Fort Wayne, Ind., has acquired the complete inventory of parts and finished units and the exclusive manufacturing rights of Torrington Lubricators from the Torrington Manufacturing Company, Torrington, Conn.

◆

ARO EQUIPMENT CORPORATION.—*C. W. Ginter,* who has been associated with the Aro Equipment Corporation, Bryan, Ohio, since its organization sixteen years ago, has been appointed vice-president of the corporation.

◆

HANNA STOKER COMPANY.—*Walter M. English,* formerly superintendent of motive power of the Chicago, Indianapolis & Louisville and for the past two years with the armed forces in Europe, has been elected executive vice-president of the Hanna Stoker Company, Cincinnati, Ohio. Mr. English is a graduate of Purdue University. He began his career as a special apprentice in the employ of the Monon in 1914. He later became division master mechanic and for 11 years served as superintendent of motive power. In 1944 he was called to Washington, D. C., commissioned a colonel in the United States Army and sent to Paris, France, where he was appointed general superintendent of motive power in general headquarters of the Military Railway Service in the European theater. He returned to America in September of last year for discharge and three months later was elected executive vice-president of Hanna.

Walter M. English

◆

MEEHANITE METAL CORPORATION.—The Meehanite Metal Corporation, Pershing Square building, New Rochelle, N. Y., has available for use by interested societies, groups, or companies a motion picture entitled "Meehanite Means Better Castings." The film, a story of the engineering characteristics of Meehanite castings and their industrial applications, is in black and white, 16-mm sound. Its running time is 29 min.

◆

CARBOLOY COMPANY, INC.—The sales department of the Carboloy Company, Detroit, Mich., headed by *K. R. Beardslee,* vice-president in charge of sales, has been divided into several divisions. *A. E. Glen,* formerly die sales engineer, is manager of the new Die Sales division. *J. E. Weldy,* assistant to the vice-president for the past three years, is manager of distributor sales; *Harry Crump,* also assistant to the vice-

president, is chief tool sales engineer, and *D. M. Chandler*, previously sales engineer at Chicago, has been appointed assistant to Mr. Beardslee.

◆

JOHNS-MANVILLE CORPORATION.—*L. M. Cassidy* and *T. K. Mial* have been elected vice-presidents of the Johns-Manville Corporation. Mr. Cassidy formerly was a vice-president of the Johns-Manville Sales Corporation, a subsidiary, in charge of the building materials and general department. In his new capacity he will direct all sales activities of the company. Mr. Mial, also formerly a vice-president in the sales corporation, was in charge of the power products and industrial department. He will undertake a new long-range development program for the company, reporting directly to the president. *Louis R. Hoff*, vice-president of the Johns-Manville Corporation in charge of sales, has retired. He has established himself as an independent consultant and will service Johns-Manville as a consultant on trade association matters.

◆

GULF OIL CORPORATION.—*Harold N. Hill*, until recently assistant to the district chief of the Birmingham, Ala., ordnance district, has been appointed manager of railway sales for the Gulf Oil Corporation. Mr. Hill is a graduate of Georgia School of

Harold N. Hill

Technology (1924) with a degree in electrical engineering. After graduation he served with the Westinghouse Electric Company and in other engineering positions until he joined the Gulf Oil Corporation in 1934 as industrial lubrication service engineer handling railway sales for the company's Atlanta, Ga., division. He entered the army as a first lieutenant and was promoted to officer in charge of production of the Birmingham, Ala., ordnance district, then to assistant to the district chief with the rank of lieutenant colonel.

◆

AMERICAN LUMBER & TREATING CO.—*Norman A. Meserve*, superintendent of the Gainesville, Fla., plant of the American Lumber & Treating Co., has been placed in charge of operations of a new wood-processing plant being constructed by the company at Florence, S. C. As head of the company's southeastern production, Mr. Meserve will direct both plants from headquarters at Florence.

DAMPNEY COMPANY OF AMERICA.—The Dampney Company of America, of Hyde Park, Boston, Mass., has acquired the Thurmalox Company, of Doylestown, Pa.

P. H. Lair has been appointed manager of the New York sales office of the Dampney Company at 114 Liberty street, where he will offer consultation and service in the field of protective coatings. *Lachlan W. MacLean* has been appointed Boston sales office manager.

P. H. Lair was born in Gloversville, N. Y., and is a graduate of Union College, Schenectady, N. Y. For the past five years

P. H. Lair

he has been engaged in industrial and mechanical engineering for one of the larger eastern engineering firms.

Lachlan W. MacLean was born in Richmond, Va. He attended Richmond Academy; received his B.S. degree from Washington and Lee University in 1921, and his M.S. degree from M. I. T. in 1924. He was in the motive-power department of the Reading at Camden, N. J., from 1924 to 1933 where he rose from electrical su-

L. W. MacLean

pervisor to general foreman. In 1933 he went to Philadelphia where he became master mechanic at the Erie Avenue enginehouse. In 1936 he became associated with The Dampney Company in the Philadelphia sales office, and from 1937 until his transfer to Boston was manager of the New York sales office.

SYLVANIA ELECTRIC PRODUCTS, INC.—*Don G. Mitchell* has been elected executive vice-president of Sylvania Electric Products, Inc. Mr. Mitchell joined Sylvania as vice-president in charge of sales in 1942.

◆

AIR REDUCTION COMPANY.—*Dr. George V. Slottman* has been appointed head of a new technical sales division organized by the Air Reduction Company, of New York, to replace its former applied engineering department. Dr. Slottman, a former professor of chemical engineering at the Massachusetts Institute of Technology, has been associated with the company for ten years. *S. D. Baumer* and *E. V. David*, who have been assistant managers of the applied engineering department, have been appointed assistant managers in the new sales division.

◆

CLIMAX MOLYBDENUM COMPANY.—*Robert L. Heath*, manager of the St. Louis, Mo., offce of the Climax Molybdenum Company, has been placed in charge of the company's metallurgical service to the railroads. Before coming with Climax Mr.

R. L. Heath

Heath was chief metallurgist of the Allison Division of the General Motors Corporation. After April 1 his headquarters will be at the company's Chicago office, 230 North Michigan avenue.

◆

ELECTRIC STORAGE BATTERY COMPANY.—*K. W. Green*, manager of Exide's railway sales division, has been appointed manager of the newly consolidated railway and engineering sales division of the Electric Storage Battery Company, Philadelphia, Pa. During the past four years, Mr. Green has been supervising the engineering sales division in addition to his duties as head of the railway division.

Obituary

COL. E. J. W. RAGSDALE, chief engineer of the railway division of the Edward G. Budd Manufacturing Company, Philadelphia, Pa., died of a heart attack on February 24. Colonel Ragsdale was 61 years of age.

◆

MORTIMER MIDDLETON, for the past four years Chicago district manager of SKF Industries, Inc., and an authority on the development of anti-friction bearings and

their application to mechanical devices, died at his home in Winnetka, Ill., on February 5.

◆

ROBERT L. GORDON, vice-president and a director of the Pullman-Standard Car Manufacturing Company, and a vice-president of the Pullman-Standard Car Export Corporation (a subsidiary firm), died at St. Petersburg, Fla., on February 12. Mr. Gordon was born at New York and was a graduate of Cornell University. Shortly after leaving college in 1895 he entered the employ of the Baldwin Locomotive Works. In 1897 he entered the engineering department of the Pressed Steel Car Company where James Buchanan Brady, later to be known as "Diamond Jim" Brady, was employed as a salesman of railroad equipment. In 1902 when Mr. Brady was elected vice-president of the newly organized Standard Steel Car Company, Mr. Gordon went along as assistant to John Hansen, president of the new firm. In 1917 Mr. Gordon was elected vice-president, succeeding Mr. Brady, who died in that year and when, in 1930, Standard Steel and Pullman-Standard were merged he was elected to the position of vice-president and director.

◆

WILLIAM ANDERSON, who retired in June, 1944, as sales manager of the Chicago office of the Pantasote Company, died at his home in Chicago on February 11.

Personal Mention

General

CARL R. ROSENBERG has been appointed assistant engineer motive power of the Bessemer & Lake Erie, with headquarters at Greenville, Pa.

A. B. LAWSON has been appointed mechanical engineer of the Baltimore & Ohio at Baltimore, Md.

C. S. PERRY, superintendent motive power of the Atlanta, Birmingham & Coast at Atlanta, Ga., has been appointed superintendent motive power of the Atlantic Coast Line, with headquarters at Atlanta.

H. L. HOLLAND, engineer car construction of the Baltimore & Ohio at Baltimore, Md., has been appointed assistant mechanical engineer at Baltimore.

WILLIAM MOORE, superintendent of motive power of the Erie at Cleveland, Ohio, has retired. Mr. Moore was born at Hornell, N. Y., and attended Park Institute, Pa. In 1906 he was a foreman for the Erie at Meadville, Pa., becoming a roundhouse foreman at Carbondale, Pa., in 1909, then general foreman at Marion, Ohio, in 1915. He was advanced to master mechanic at Kent, Ohio, in 1918, transferring to Susquehanna, Pa., in 1921, and to Buffalo, N. Y., in 1938. In 1941 Mr. Moore was promoted to assistant to the superintendent of motive power with headquarters at Cleveland. He became superintendent of motive power there on October 1, 1943.

William Moore

S. D. FOSTER, superintendent of shops of the New York Central at Collinwood, Ohio, has been appointed assistant superintendent of equipment, with headquarters at Cleveland, Ohio.

F. C. RUSKAUP, master mechanic of the New York Central at Springfield, Mass., has been appointed assistant superintendent of equipment, with headquarters at Indianapolis, Ind.

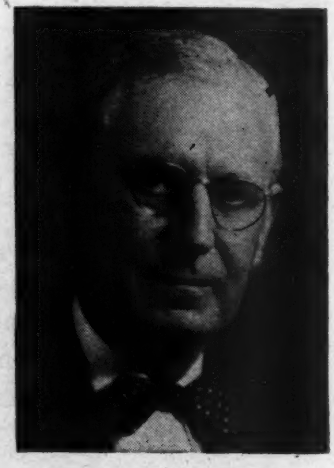
GEORGE W. BIRK, whose appointment as superintendent of equipment of the New York Central at Indianapolis, Ind., was reported in the February issue, was born at Indianapolis on April 19, 1900. He is a graduate of Purdue University (1925), and first entered railroad service in 1918 as a machinist apprentice in the employ of the New York Central at Indianapolis. He served as a special apprentice from 1924 to 1929, when he became special engineer at Indianapolis. On April 22, 1930, he became assistant air-brake supervisor; on February 16, 1936, special inspector; on October 1, 1937, lubrication inspector, and on August 1, 1940, supervisor of locomotive and fuel performance at Buffalo, N. Y. On February 1, 1941, Mr. Birk was appointed assistant to the general superintendent of motive power at New York; later in the same year assistant superintendent of locomotive shops at Indianapolis; on December 1, 1941, superintendent of locomotive shops at Indianapolis; on July 1, 1942, assistant to the general superintendent of motive power at New York, and on February 1, 1944, assistant superintendent of equipment at Indianapolis.

F. R. HOSACK, former mechanical superintendent of the Missouri Pacific at St. Louis, Mo., recently released from the armed forces, has been appointed assistant chief mechanical officer, with the same headquarters. Mr. Hosack was born at Cumberland, Md., on March 3, 1899, and entered railroad service on August 1, 1915, as an apprentice machinist in the employ of the Southern Pacific at Ennis, Tex. Released from the armed forces in September, 1919, he became a machinist on the Atchison, Topeka & Santa Fe at Temple, Tex. On May 4, 1920, he went with the International-Great Northern, and served at various points on that line as mechanical foreman, enginehouse foreman, and general foreman until December 31, 1930, when he entered the service of the St. Louis, Brownsville & Mexico first as general foreman at Kingsville, Tex., and later as master mechanic. On January 1, 1937, Mr. Hosack became mechanical superintendent of the Western district of the Missouri Pacific at St. Louis. He entered the armed forces on August 15, 1942.

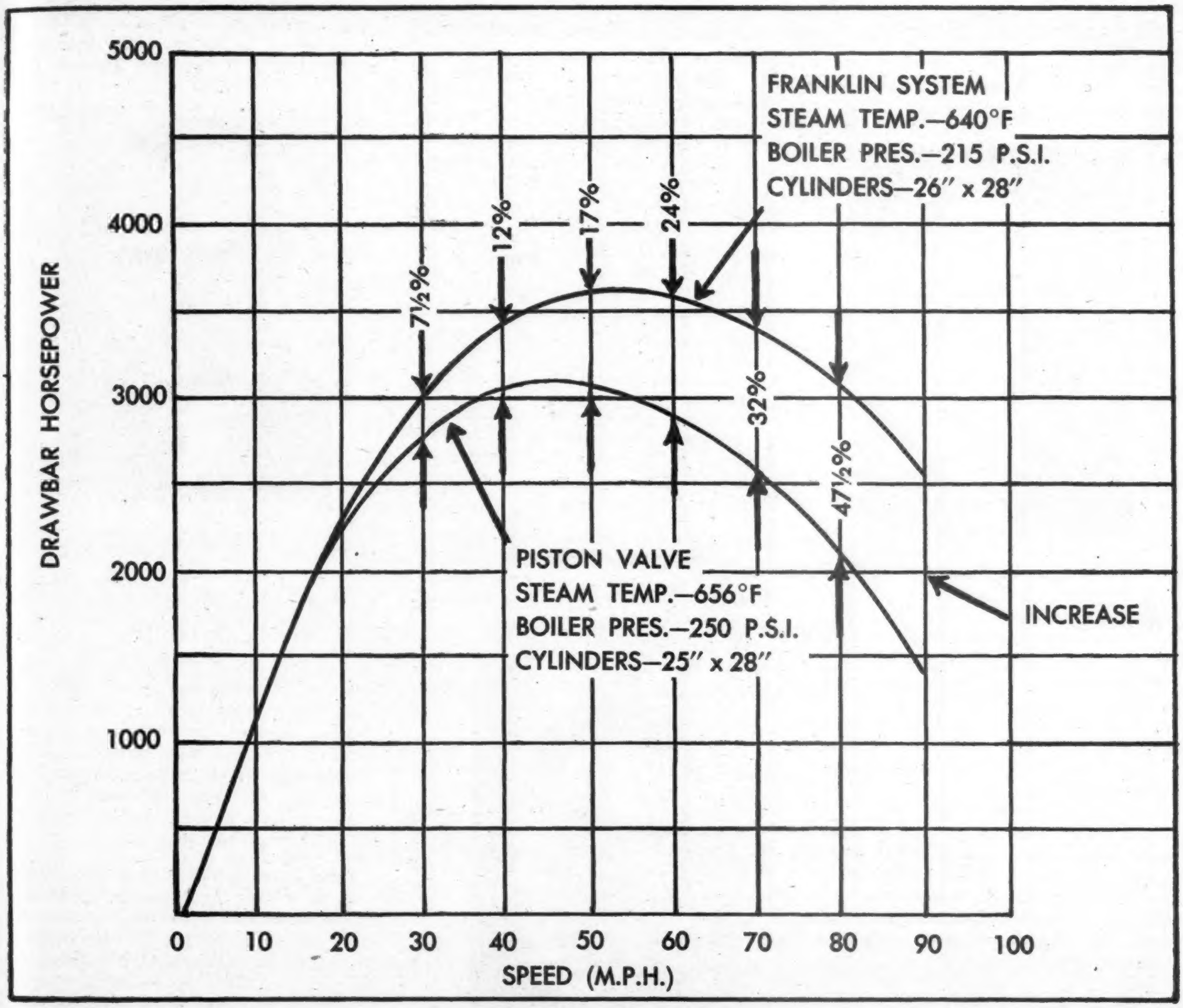
A. L. WRIGHT, assistant superintendent of equipment of the New York Central, has been appointed superintendent of equipment with headquarters as before at Cleveland, Ohio.

C. K. JAMES, master mechanic, Western district of the Erie, at Meadville, Pa., has been appointed assistant superintendent of motive power with headquarters at Cleveland, Ohio.

W. B. WHITSITT, whose retirement as chief engineer of motive power and equipment of the Baltimore & Ohio was announced in the February issue, was born on May 27, 1883, at Lexington, Ky. He entered railway service in 1903 as a draftsman in the employ of the Baltimore & Ohio at Newark, Ohio. In 1907, he was transferred to the Mt. Clare shops at Baltimore, Md., where he became an apprentice instructor in 1915. He was appointed assistant chief draftsman in 1917; chief draftsman in 1918; assistant mechanical engineer in 1922; mechanical engineer in 1926; assistant chief of motive power and equipment in 1937, and chief of motive power and equipment in 1942. Mr. Whitsitt's duties as chief of motive power and equipment included authority over research, design, standards, and new construction.



W. B. Whitsitt



To increase LOCOMOTIVE CAPACITY

• To increase the capacity of some of its older locomotives, a railroad found that the installation of The Franklin System of Steam Distribution would produce the drawbar horsepower shown on the chart above.

The alternative, involving higher steam pressure, would necessitate a new boiler, frame and running gear. Even then, the drawbar horsepower, with piston valves, would be substantially less than with The Franklin System.

You too may find that the answer to today's demand for greater power and speed is The Franklin System of Steam Distribution.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

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W. A. CARLSON, assistant superintendent of motive power of the Erie at Cleveland, Ohio, has been appointed superintendent of motive power with headquarters at Cleveland. Mr. Carlson was born at Chicago on

W. A. Carlson

April 27, 1890. He entered railway service in 1906 as a machinist helper in the employ of the New York, Chicago & St. Louis (Nickel Plate), at Chicago, subsequently becoming a machinist at Fort Wayne, Ind. He joined the Chicago & Alton (now the Alton) in 1913, as a machinist at Chicago, and went with the Chicago, Rock Island & Pacific as a machinist in 1914. In 1915 Mr. Carlson returned to the Nickel Plate as a machinist and later served as enginehouse foreman and general foreman at Fort Wayne. In 1928 he became general master mechanic of the Erie at Hornell, N. Y.; in 1921 master mechanic, Western district, at Meadville, Pa., and in 1943 assistant superintendent of motive power at Cleveland.

FRED H. EINWAECHTER, whose appointment as chief engineer of motive power and equipment of the Baltimore & Ohio at Baltimore, Md., was announced in the February

Fred H. Einwaechter

issue, entered the service of the B. & O. as an apprentice in 1913. In November, 1917, he became a drafsman and in July, 1923, leading draftsman. He was appointed assistant engineer of the Mount Clare shops in June, 1927; assistant engineer in the locomotive department in June, 1927, and mechanical engineer in January, 1942.

JAMES H. WILSON has been appointed chief mechanical officer of the Norfolk Southern, with headquarters at Norfolk, Va. The position of assistant chief mechanical officer formerly held by Mr. Wilson has been abolished. Mr. Wilson was born in Valdosta, Ga. He began his railway career in 1904 as a machinist apprentice in the shops of the Seaboard Air Line at Tallahassee, Fla. From 1909 until October, 1917, he served in the mechanical and electrical departments of the Atlantic Coast Line. He then became chief electrician of the Norfolk Southern. In March, 1934, he was appointed chief mechanical inspector and assistant superintendent motive power, and on September 1, 1937, became assistant chief mechanical officer.

NORMAN WATSON, electrical engineer in the architects department of the Canadian National, has been appointed electrical and mechanical engineer, with headquarters as before at Montreal, Que.

F. A. BENGER, acting chief mechanical engineer of the Canadian Pacific, has been appointed chief mechanical engineer, with headquarters as before at Montreal, Que. Mr. Benger is a graduate of Queens University. He began his career as a special

F. A. Benger

apprentice at the Canadian Pacific's Angus (Que.) shops in 1911. He was loaned to the Dominion government for special duties in the Dominion Arsenal at Quebec City, Que., during World War I. After returning to the C. P. R., he rose, by 1942, to the position of acting chief mechanical engineer. In the summer of 1944, he was responsible for designing and building engines 1200 and 1201, the first locomotives built by the Canadian Pacific since 1931. Mr. Benger's "1200" class engines will be models for part of the C. P. R.'s postwar replacement program.

O. M. TOOMEY has been appointed assistant to the superintendent of motive power of the Western Pacific, with headquarters at Sacramento, Calif.

R. L. PIERCE has been appointed superintendent motive power of the Georgia & Florida, with headquarters at Douglas, Ga.

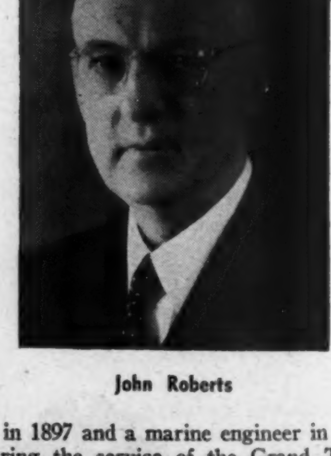
G. CHARLES HOEY has been appointed assistant mechanical engineer of the Bessemer & Lake Erie at Greenville, Pa.

R. A. SMITH, chief draftsman and assistant engineer of the Canadian Pacific until transferred to the munitions department in World War II, has been appointed me-

Roy A. Smith

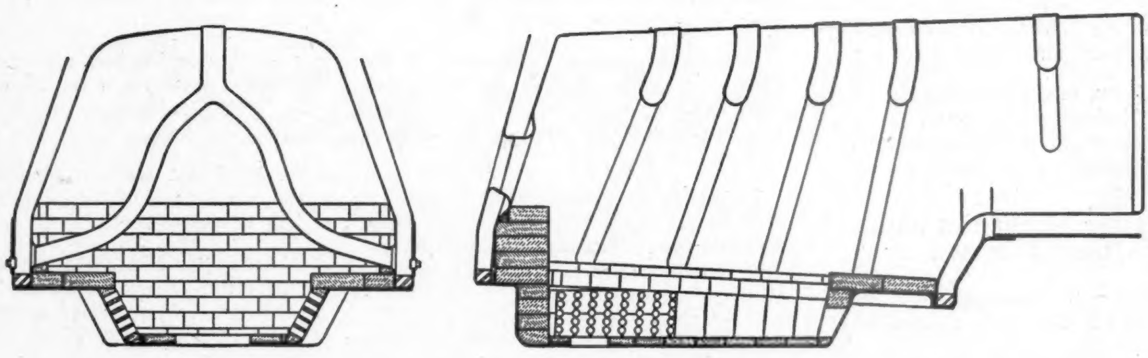
chanical engineer (locomotive) of the Canadian Pacific, with headquarters at Montreal, Que. Mr. Smith began his railroad career with the C. P. R. in 1908 at the Angus (Que.) shops. There he was assigned to special war work in the shell plant during World War I. Rising to the position of chief draftsman and assistant engineer by the time of World War II, he was again transferred to the munitions department, becoming supervisor of many of the contracts in the C. P. R.'s munitions manufacturing program.

JOHN ROBERTS, managing director of National Railways Munitions, Ltd., operated by the Canadian National, at Montreal, Que., retired on January 15. Mr. Roberts was born in Kilmarnock, Scotland, on November 14, 1881. He became an appren-



John Roberts

tice in 1897 and a marine engineer in 1902, entering the service of the Grand Trunk (now the C. N. R.) at Stratford, Ont., in 1903 as a machinist. Progressing through various sections of the shops, he became foreman in 1915, general foreman in 1920, and superintendent motive power in 1921. In 1925 Mr. Roberts went to Montreal as general supervisor of shop methods and in 1932 became general superintendent, motive power and car equipment, Central



A type of Security Circulator for oil-burning locomotives that provides efficient heating surface with unimpeded circulation

Six Years of Service

in oil-burning locomotives

Since the first installations of Security Circulators in oil-burning locomotives were made in 1939, their value for improving boiler performance has been conclusively demonstrated.

In such installations the intakes of the Circulators are placed as near the mud-ring as possible to improve boiler water circulation, which aids in minimizing firebox troubles.

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SECURITY CIRCULATOR DIVISION

region, with headquarters in Toronto, Ont. The following year he was appointed chief of motive power and car equipment for the system, with headquarters at Montreal. Since 1943 until its cessation on January 15, 1946, Mr. Roberts, as managing director, devoted all his time to the National Railways Munitions, Ltd.

H. C. CANN, mechanical engineer of the Canadian National at Montreal, Que., has been transferred to the hotel department as supervisory engineer at Ottawa, Ont.

Master Mechanics and Road Foremen

S. T. KUHN has been appointed master mechanic of the New York Central at Toledo, Ohio.

R. C. CROSS has been appointed master mechanic of the New York Central at Columbus, Ohio.

C. F. BURNS has been appointed master mechanic of the Boston & Albany, with headquarters at West Springfield, Mass.

F. T. SUMNER has been appointed road foreman of engines, mechanical department —all divisions, of the Norfolk Southern.

F. L. HOFFMAN has been appointed assistant master mechanic of the New York Central, with headquarters at Buffalo, N. Y.

L. R. HAASE, master mechanic of the Baltimore & Ohio at Chicago, has been transferred to the Buffalo division, with headquarters at DuBois, Pa.

G. L. FISHER, master mechanic of the Erie at Meadville, Pa., has been appointed master mechanic, Western district, with headquarters at Meadville.

H. L. PHELPS, master mechanic of the Erie at Secaucus, N. J., has been transferred to the position of master mechanic at Meadville, Pa.

F. D. DUNTON, master mechanic of the Erie at Avoca, Pa., has been transferred to the position of master mechanic at Secaucus, N. J.

G. W. SHORT, general foreman of the Baltimore & Ohio at Chicago, has been appointed master mechanic, with headquarters at Chicago.

Car Department

H. W. HUGHES, car foreman of the Canadian National at Limoilou, Que., has retired.

H. HICKS, car foreman of the Canadian National at Chauvigny, Que., has been transferred to the position of car foreman at Joffre, Que.

ARNOLD MEYERS, equipment inspector of the Bessemer & Lake Erie at Greenville, Pa., has been appointed assistant master car builder, with headquarters at Greenville.

R. LABADIE, foreman of the Canadian National at Joffre, Que., has been transferred to the position of car foreman at Limoilou, Que.

B. ASSELIN has been appointed car foreman of the Canadian National at Chauvigny, Que.

O. C. SWANSON has been appointed airbrake inspector of the Southern, with headquarters at Spencer, N. C.

C. E. DYER, general car foreman of the Chicago & North Western at Milwaukee, Wis., has been promoted to the position of terminal supervisor of car maintenance, with headquarters at Proviso, Ill.

PETER KASS, superintendent of the car department of the Chicago, Rock Island & Pacific, with headquarters at Chicago, has retired after 52 years of railroad service.

F. J. CEBULLA, whose promotion to master car builder of the Great Northern, with headquarters at St. Paul, inn., was reported in the February issue, was born in Germany on May 30, 1881. He entered railroad service on April 12, 1902, in the car department of the Great Northern at Havre, Mont., and served as car foreman from February 8, 1908 until July 15, 1912,

F. J. Cebulla

when he became foreman of the car shops at Superior, Wis. In April, 1928, Mr. Cebulla was promoted to the position of superintendent at St. Cloud, Minn., and on December 1, 1937 was appointed assistant master car builder at St. Paul.

Electrical

GEORGE T. JOHNSON, assistant electrical engineer of the New York, New Haven & Hartford at New Haven, Conn., retired on February 1, after more than 41 years of service on the New Haven.

Shop and Enginehouse

C. M. HARTMAN has been appointed assistant foreman of the Pennsylvania, Middle division, Altoona, Pa.

J. M. FINLEY has been appointed to the newly created position of welding inspector of the Canadian National, with headquarters at Montreal, Que.

BADEN P. TAYLOR, foreman at the Van Nest shops of the New York, New Haven & Hartford, at New York, has been appointed chief inspector at Van Nest.

E. P. FAIRCHILD has become general boiler inspector of the Atlantic Coast Line at Wilmington, N. C.

JAMES H. MACLEAN, assistant foreman of the Canadian National at Stellarton, N. S., has retired.

R. L. PONTON has been appointed general mechanical inspector of the Atlantic Coast Line with headquarters at Wilmington, N. C.

W. N. NAGLE has been appointed superintendent of shops of the New York Central at Collinwood, Ohio.

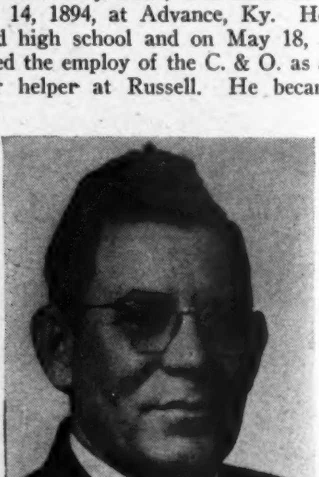
CHARLES M. MELLISH, unit car maintainer of the Canadian National at Truro, N. S., has been transferred to the position of assistant foreman at Truro, N. S.

ROY O'BLENIS, assistant foreman of the Canadian National at Truro, N. S., has been transferred to the position of assistant foreman at Stellarton, N. S.

GRANT MACLEAN, locomotive foreman of the Canadian National at Sydney, N. S., has been transferred to the position of locomotive foreman at Truro, N. S.

MARTIN R. SLACK, assistant superintendent of the Van Nest shops of the New York, New Haven & Hartford at New York, has been appointed superintendent of the shops.

JAMES GARLAND RAYBURN, who has been appointed shop superintendent of the Chesapeake & Ohio at Russell, Ky., as announced in the February issue, was born on February 14, 1894, at Advance, Ky. He attended high school and on May 18, 1909, entered the employ of the C. & O. as a car repair helper at Russell. He became a



J. G. Rayburn

car repairer on January 31, 1910, and gang foreman on October 1, 1922. He was transferred to Parsons, Ohio, as assistant general foreman on April 5, 1926; was promoted to the position of assistant general car foreman there on November 16, 1930, and to the position of general car foreman on June 12, 1933. He was appointed general car inspector at Columbus, Ohio, on September 16, 1941; chief car inspector at Richmond, Va., on October 16, 1942, and shop superintendent at Russell on December 1, 1945.

John W. O'Meara, superintendent of the Van Nest shops of the New York, New Haven & Hartford at New York, has retired after 51 years' service.

J. J. Daugherty, recently released from the armed forces, has been appointed superintendent of shops of the Southern Pacific at Houston, Tex. Mr. Daugherty had formerly been general locomotive foreman at Houston.

Obituary

Harry W. Jones, chief of motive power of the Pennsylvania at Philadelphia, Pa., died at his home on February 23. Mr. Jones, who was 61 years old, had been with the Pennsylvania for 43 years.

A. B. Wilson, superintendent of motive power of the Southern Pacific, with headquarters at Sacramento, Calif. died at his home in that city on December 16. Mr. Wilson was born at Osawatomie, Kan., on April 3, 1888, and entered railroad service in 1905 as a machinist apprentice in the employ of the Missouri Pacific at Osawatomie. In 1911 he entered the service of the Southern Pacific as a machinist, and was promoted to the position of enginehouse foreman at Albany, Ore., in 1912. From 1925 to 1931 he was assistant master mechanic successively at Oakland, Calif., Sparks, Nev., and Eugene, Ore. In November, 1931 he became master mechanic and served successively at Brooklyn, Ore., and at San Francisco, Calif. In April, 1939 Mr. Wilson was appointed assistant superintendent of motive power, with headquarters at Sacramento, and in March, 1942, superintendent of motive power at Sacramento.

George Crowder, superintendent motive power of the Georgia & Florida at Douglas, Ga., since 1929, died there on December 3, 1945. Mr. Crowder was born in Meriweather County, Ga., and began his career

George Crowder

as a machinist apprentice in the employ of the Baldwin Locomotive Works in 1904, being appointed track foreman in the erecting shop at the conclusion of his apprenticeship. In 1904 he went with the El Paso & Northeastern (now part of the Southern Pacific) as a machinist at Alamo Gordo, N. M. He returned to Georgia in 1905 as a machinist in the Waldo shops of the Seaboard Air Line and in 1907 became enginehouse foreman of the Atlantic Coast Line at Jacksonville, Fla. After a short period of service later in 1907 on the Southern at Augusta, Ga., Mr. Crowder became general foreman of the Douglas, Augusta & Gulf (now the Georgia & Florida) at Douglas, Ga. He was appointed superintendent of motive power of the Georgia & Florida on February 1, 1929.

R. W. Retterer, superintendent of equipment of the New York Central, with headquarters at Indianapolis, Ind., died on December 28. Mr. Retterer was born at Marion, Ohio, on December 21, 1888. He entered railroad service in July, 1904, as a caller on the New York Central, and served in various minor positions until July 1, 1915, when he became head draftsman. On January 1, 1917, he was appointed assistant mechanical engineer; on September 16, 1921, mechanical engineer; on October 1, 1940, assistant superintendent of equipment, and on February 1, 1944, superintendent of equipment.

Trade Publications

Copies of trade publications described in the column can be obtained by writing to the manufacturers, preferably on company letterhead, giving title. State the name and number of the bulletin or catalog desired, when it is mentioned.

"Fiberglas Thermal Insulation." — Owens-Corning Fiberglas Corporation, Toledo 1, Ohio. Twenty-eight page illustrated booklet containing design and application data on Fiberglas thermal insulations for commercial and industrial equipment such as buses, railway cars, trucks, etc.

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Lift Trucks.—Hyster Company, 1800 North Adams street, Peoria 1, Ill. Sixteen page illustrated booklet describes the 1946 Hyster 40 industrial lift truck, with pneumatic tires, for hoisting and transporting loads indoors and outdoors.

◆

Electro-Magnetic Chucks.—Hanchett Manufacturing Co., Big Rapids, Mich. Eighteen-page Bulletin 045-1 describes in detail complete line of Hermetic-Coil electromagnetic chucks, with illustrations of actual set-ups.

◆

Scullin Steel.—Scullin Steel Co., 6701 Manchester, St. Louis 10, Mo. "100 Acres of Skill and Steel," a pictorial tour through the Scullin plant, with explanations of the operations in the various plants and illustrations of finished castings.

◆

Case Hardening. — Surface Combustion Corporation, Toledo 1, Ohio. Four-page Bulletin No. SC-127 describes case hardening in "Surface" standard rated furnaces. Application of pack, liquid and gas carburizing is covered, with illustration of case-hardened steel parts and actual furnace installations. Includes also a table of pot recommendations.

HYDRAULIC CYLINDERS.—Logansport Machine Co., Inc., Logansport, Ind. Catalog 84 illustrates and describes the new standard Rotocast hydraulic cylinders, with specifications and engineering data on the various available cylinder types.

◆

WHEEL TREAD GRINDER OPERATING MANUAL.—American Car and Foundry Company, 30 Church street, New York 8. "High-Speed Wheel Tread Grinder Operating Manual," printed in color, in folder form, shows in detail the construction, installation, and operation of the latest design of tread grinder on which wheels 24 in. to 45 in. in diameter may be ground.

◆

PRECISION MICROCASTINGS. — Austenal Laboratories, Inc., 5932 S. Wentworth avenue, Chicago 21. Eight-page booklet, "The Microcast Process," explains the process. Gives specifications and the physical and chemical properties of Vitallium microcastings and illustrates castings of intricate shape and design produced of high melting point, non-machineable alloys by Microcast.

◆

"SPECIAL MACHINE TOOLS FOR DIESEL ENGINE METAL WORKING OPERATIONS."—W. F. and John Barnes Company, Rockford, Ill. 48-page pictorial review, describing briefly the various Barnes unit-type and special machines designed and built to perform multiple machining operations on Diesel engine components.

◆

STAINLESS STEEL. — Allegheny Ludlum Steel Corporation, Brackenridge, Pa. One hundred page Handbook on Stainless Steel, with data on 26 types. Finder chart lists the more important types of stainless and heat-resisting steels made by Allegheny Ludlum and analyzes the general and mechanical properties of each grade. Sections following the chart describe the general characteristics of these steels, with suggestions as to their application, and tabulate the resistance of the most widely used grades to attack by various media. Forms, sizes, and finishes available also are discussed.

◆

BEARING ALLOYS.—Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5. "Bearing Alloys Technical Manual" presents information on the design, construction and maintenance of friction-type bearings for all kinds of machinery. Covers The History of Bearing Metals; Some Significant Developments; The Effect of Composition on Bearing Alloys; The Melting of Bearing Alloys; The Bonding of Bearings; The Casting of Bearing Alloys, and Causes of Bearing Failure.

◆

WELDED FABRICATION. — The United Welding Company, Middletown, Ohio. "Tailoring in Metal," a 20-page manual intended to aid engineers and designers in deciding if fabrication by welding and the materials made available by this method are applicable to their problems. Explains various types of welds and how they affect static and fatigue load values, with specific information about devices which can be used to reduce cost and improve construction. Illustrated with drawings and photographs.